US Army Corps
of Engineers ®
Portland District

Columbia River at the Mouth, Oregon and Washington

North and South Jetties and Jetty A
Major Rehabilitation

Draft Environmental Assessment

Draft June 2006

ABBREVIATIONS AND ACRONYMS

AQI	Air Quality Index
CERCLA	Comprehensive and Environmental Response, Compensation, and Liability Act
Corps	U.S. Army Corps of Engineers
cfs	cubic feet per second
cy	cubic yard(s)
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EA	Environmental Assessment
EFH	Essential Fish Habitat
ESU	Evolutionarily Significant Unit
HTRW	Hazardous, Toxic, and Radioactive Waste
MCR	Mouth of the Columbia River
MLLL	Mean Lower Low Water
MSL	mean sea level
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NAGPRA	Native American Graves Protection and Repatriation Act
ODFW	Oregon Department of Fish and Wildlife
PNNL	Pacific Northwest National Laboratory
ppt	parts per thousand
PCE	Primary Constituent Element
RCRA	Resource Conservation and Recovery Act
RM	River Mile
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife

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1. INTRODUCTION

This Environmental Assessment (EA) evaluates the environmental effects of a major rehabilitation for the North and South jetties and Jetty A, which are part of the U.S. Army Corps of Engineers' (Corps) Mouth of the Columbia River (MCR) navigation project (Figure 1). The project features for the MCR navigation project were authorized by the River and Harbor Acts of July 5, 1884, March 3, 1905, and September 3, 1954. The navigation project consists of a 0.5-mile wide navigation channel extending for about 6 miles through a jettied entrance (3 miles seaward and shoreward of the tip of the North Jetty) between the Columbia River and the Pacific Ocean. The jetties were constructed at the entrance to the Columbia River to confine and direct tidal currents, which helps maintain the depth and orientation of the navigation channel, and to provide protection for ships of all sizes (both commercial and recreational) entering and leaving the Columbia River.

The forces of nature have taken their toll on the structural integrity of the jetties, but the Corps is working at restoring them to acceptable levels of reliability. The latest partial repairs were made in 1982, 1965, and 1962 for the South, North, and Jetty A, respectively. More recently, interim repairs for portions of the North Jetty were completed in 2005. Interim repairs also are scheduled for portions of the South Jetty and should be completed by October 2007. Funding for major rehabilitation of the jetties has not been secured at time of publication of this EA.

The Corps is currently conducting physical and numerical modeling at the Engineering, Research, and Development Center in Vicksburg, Mississippi. Modeling will show how conditions about the MCR, such as current directions and velocities and sand movement, would be altered with a variety of construction scenarios. This information will be essential in determining magnitude of a wide variety of impacts. This EA is meant to introduce possible project scenarios and allow for early public input.

1.1. Purpose and Need for Action

Purpose. The purpose of the proposed action is to perform major rehabilitation on the North and South Jetties and Jetty A at the MCR in order to strengthen and extend the functional lives of the jetties, and provide long-term reliability.

Need. Structural degradation of the jetties has accelerated in recent years because of increased storm activity and loss of sand shoal material, upon which the jetties are constructed. In addition, beaches on the ocean sides of the North and South Jetties, which formed as a result of jetty construction, have been receding gradually over the years exposing previously protected sections of the jetties at the beach line to storm waves. Major rehabilitation resulting in strengthening of the jetties and extending their functional lives is necessary in order to ameliorate deterioration and prevent breaching of the jetties. No action would result in further deterioration of the jetties and the sand shoals and increase the likelihood of breaching. Recent partial repairs on the North Jetty and current partial repairs on the South Jetty have addressed immediate needs, while major rehabilitation would address long-term needs for the entire lengths of the structures and reduce the potential for emergency repairs.

1.2. Project Area Description

The North Jetty and Jetty A are located in Pacific County, Washington, near the communities of Ilwaco and Long Beach on the Long Beach Peninsula (Figure 1). The 2.5-mile long North Jetty was completed in 1917 to help stabilize shoaling at the mouth of the Columbia River. Three subsequent repairs to the North Jetty have been made, with the last one completed in 2005. Jetty rock placement

at the North Jetty, to date, totals approximately 3.4 million tons. Approximately 0.35 mile of the tip of the North Jetty has eroded since initial construction and is no longer functional. Jetty A, positioned on the south side of the North Jetty, was constructed in 1939 to a length of 1.1 miles and is located upstream of the North Jetty. It is designed to direct the navigation channel away from the North Jetty foundation.

The South Jetty is located in Clatsop County, Oregon near the community of Warrenton/Hammond (Figure 1). The South Jetty is about 6.6 miles long. The initial 4.5-mile section of the South Jetty was completed in 1896, with a 2.4-mile extension completed in 1914. At least six spur groins perpendicular to the jetty (lengths 500 to 1,000 feet) were authorized and six were constructed in order to stabilize the jetty foundation. Over 4,000 feet of head loss has occurred at the South Jetty. Four subsequent repairs to the South Jetty have been completed (last one in 1982) and interim repairs are currently being made. Jetty rock placement at the South Jetty, to date, totals approximately 8.7 million tons. Additional interim repairs are scheduled for portions of the South Jetty in 2006-2007.

2. AFFECTED ENVIRONMENT

2.1. Physical Characteristics

The Columbia River estuarine environment extends from the mouth to river mile (RM) 38. The river varies from 2 to 5 miles wide throughout the estuary and is about 1 mile wide at RM 30. Tidal effect extends almost 150 miles upstream (Corps 1983), but the saltwater wedge is limited to RM 20 (Corps 1999). The North and South jetties and Jetty A were constructed at the mouth to help stabilize the channel, reduce the need for dredging, and provide protection for ships. The navigation channel is currently maintained at authorized depths of 48-55 feet deep below mean lower low water (MLLW) and 0.5-mile wide from RM -3 to RM 3. River flows are controlled by upstream storage dams. A dredged material disposal site near the North Jetty, known as the North Jetty Site (Figures 2-4), was established in 1999 to protect the North Jetty from erosion. About 100,000 to 500,000 cubic yards of sand are placed there annually.

The MCR is a high energy environment. Horizontal circulation in the estuary is generally clockwise (when viewed from above), with incoming ocean waters moving upstream in the northern portion of the estuary and river waters moving downstream in the southern portion. Vertical circulation is variable, reflecting the complex interaction of tides with river flows and bottom topography and roughness (Corps 1983).

2.1.1. Waves, Currents, and Morphology

The ocean entrance at MCR is characterized by large waves and strong currents interacting with spatially variable bathymetry. The MCR entrance is considered one of the world's most dangerous coastal inlets for navigation. Approximately 70% of all waves approaching the MCR are from the west-northwest (Moritz and Moritz 2004). During winter storm conditions, the ocean offshore of the jettied river entrance is characterized by high swells approaching from the northwest to southwest combined with locally generated wind waves from the south to southwest. From October to April, average offshore wave height and period are 9 feet and 12 seconds, respectively. During the winter storm season, wave heights incident to the north and south jetties can reach heights of 20 to 35 ft., having wave period of 12 to 22 seconds. Loss of underwater sand shoals allows the large storm waves to approach closer to the jetties. From May to September, average offshore wave height and period are 5 feet and 9 seconds, respectively, and waves approach mostly from the west-northwest. Occasional summer storms produce waves approaching MCR from the south-southwest with wave heights of 6.5 to 13 feet and wave periods of 7 to 12 seconds. Astronomical tides at MCR are mixed

semi-diurnal with a diurnal range of 7.5 feet. The instantaneous flow rate of estuarine water through the MCR inlet during ebb tide can reach 1.8 million cubic feet per second. Tidally dominated currents within the MCR can exceed 8.2 feet per second. A large, clockwise-rotating eddy current has been observed to form between the North Jetty, the navigation channel, and Jetty A during ebb tide. A less pronounced counter-clockwise eddy forms in response to flood tide. The North Jetty eddy has varying strength and direction (based on location and timing of tide) ranging from 0.3 to 3.3 feet per second.

As waves propagate shoreward toward the MCR, the waves are modified (waves begin to shoal and refract) by the asymmetry of the MCR's underwater morphology. Nearshore currents and tidal currents are also modified by the jetties and the MCR's morphology. These modified currents interact with the shoaling waves to produce a complex and agitated wave environment within the MCR. The asymmetric configuration of the MCR and its morphology are characterized by the significant offshore extent of Peacock Spit on the north side of the North Jetty, southwesterly alignment of the north/south jetties and channel, and the absence of a large shoal on the south side of the MCR. The asymmetry of the MCR causes incoming waves to be focused onto areas which would not otherwise be exposed to direct wave action. An example of this wave-focusing effect is the area along the south side of the North Jetty. Upon initial inspection, it would appear that this area is most susceptible to wave action approaching the MCR from the southwest. However, this is not the case; the opposite is what occurs. The area located between the North Jetty, the navigation channel, and Jetty A is affected by wave action during conditions when the offshore wave direction is from the west-northwest, because of the refractive nature of Peacock Spit. Waves passing over Peacock Spit (approaching from the northwest) are focused to enter the MCR along the south side of the North Jetty. Conversely, large waves approaching the MCR from the southwest are refracted/diffracted around the South Jetty and over Clatsop Spit, protecting the south side of the North Jetty from large southerly waves.

The stability of the MCR channel is related to the jetties and the morphology of Peacock Spit and Clatsop Spit (Moritz et al., 2003). Through phased jetty construction from 1885 to 1939 and the associated response of MCR morphology, the project features at MCR and the resultant morphology are now mutually dependent, both in terms of structural integrity and project feature functional performance.

2.1.2. Foundation Conditions

The MCR jetties were constructed on underwater sand shoals. These shoals are now considered to be crucial project elements. These shoals are receding, however and as the shoals recede, the sediment budget affecting the adjacent littoral zones north and south of MCR will be diminished. As the morphology near the MCR jetties experiences significant recession (erosion), the jetties will be undermined by waves and currents.

2.1.3. Landforms

Near the Oregon shore of the estuary, Clatsop Spit is a coastal plain. On the Washington shore, Cape Disappointment is a narrow, rocky headland. Extensive accretion of land has occurred north of the North Jetty since its construction. This accreted land, however, is now in the process of recession as is evident by erosion at Benson Beach. The Corps is in the process of evaluating possible use of Columbia River sand to place back into the littoral drift north of the North Jetty. This is a separate investigation exploring beneficial uses of dredged material. Behind the headland is beach dune and swale. Wetlands occur on accreted land north of the North Jetty and on Clatsop Spit.

2.2. Fish and Wildlife

A variety of anadromous and resident fish occur within the Columbia River offshore area. Occurrence of adult migratory salmon in the offshore area is correlated primarily with their period of upstream migration. Juvenile migratory species are present following their migration out of the Columbia River estuary primarily in the spring and fall. Resident species occur throughout the year with many using the estuary as a rearing and nursery area. Species present include various flatfish, rockfish and other demersal species (Corps 1999).

Almost all of the Columbia River offshore area experiences some type of commercial fishing activity. The major fisheries are for, bottom fish, salmon, crab, and other species of shellfish. Crab fishing occurs from December to September with the majority of the catch occurring early in the season. Most crab fishing occurs north of the Columbia River mouth at depths ranging from 25 to 250 feet mean sea level (MSL). Dungeness crab population numbers are subject to large cyclic fluctuations in abundance. Catch records for the fishery are generally believed to represent actual population fluctuations. Modeling studies by Higgins and others (1997) has shown that small scale environmental changes, such as delay in the onshore currents in the spring by a short period of time, can dramatically impact survival of young-of-the-year crab but have no effect on adults and older juveniles inshore. Bottom fishing by trawl for flatfish, rockfish, and pink shrimp occurs year-round throughout the entire offshore area, primarily at depths offshore from the jetties. Commercial and recreational salmon fishing occurs over much of the offshore area.

Marine mammals known to occur in the Columbia River offshore area include gray whale, dolphins, porpoises, sea lions, and harbor seals. Most cetacean species observed by Green and others (1991) occurred in slope (600 to 6000-foot depths) or offshore waters. Harbor porpoises and Gray whales were prevalent in shelf waters less than 600 feet deep. Pinniped species likely to occur in the vicinity of the jetties are harbor seal, California sea lion, and Steller sea lion (also known as northern sea lion). A major haulout area for Steller sea lions occurs on the South Jetty.

Four species of marine turtles, loggerhead, green, Pacific ridley and Pacific leatherback, have been recorded from strandings along the Oregon and Washington coasts. They were typically associated with warmer waters that occur over the Pacific slope waters during summer (Green et al., 1991).

Pelagic birds are extremely numerous off the Columbia River including gulls, auklets, common murres, fulmars, phalaropes, and kittiwakes. Briggs and others (1992) found that seabird populations were most densely concentrated over the continental shelf (less than 600 feet in depth). Brown pelicans typically occur from late spring to mid-fall along the Oregon and Washington coasts. Concentrations of this species develop at the mouth of the Columbia River at the South Jetty and East Sand Island-Baker Bay. This species forages in nearshore waters of the Pacific Ocean and estuarine waters of the Columbia River (Briggs et al., 1992). Three species of cormorants occur in the Columbia River estuary and forage in nearshore Pacific Ocean waters, the estuary or upriver. Pelagic and Brandt's cormorants nest on the cliffs of Cape Disappointment (Corps 1999). Three species of terns occur in the Columbia River or over nearshore waters. Caspian terns are present from April to September and have established large colonies on islands within the estuary. Common and arctic terns occur off the Oregon and Washington coasts from April to September (Corps 1999). Shorebirds found on coastal beaches at MCR include western sandpipers, sanderlings, dunlins, least sandpipers, and semi-palmated plovers.

Federally listed threatened and endangered species which may occur in the Columbia River offshore area include 15 wildlife species and 13 runs of salmon and steelhead. Wildlife species include blue, finback, sei, right, hump-backed and sperm whales; Steller sea lion; Columbian white-tailed deer;

loggerhead and Pacific leatherback sea turtles; brown pelican; marbled murrelet; western snowy plover; bald eagle; Oregon silverspot butterfly. Adults and juveniles of the 13 listed salmonid stocks are present in the lower river year-round.

Both the North and South jetties are located in high-energy areas subject to strong tidal and river currents and wave action. These high-energy conditions contribute to continual movement of sediments with both deposition and erosion occurring.

2.3. Cultural and Historic Resources

There are no recorded historic properties within the immediate jetty areas. There are no known shipwrecks that could be affected by the proposed project. The jetties themselves are over 50 years old and are therefore eligible for the National Register of Historic Places.

2.4. Socio-economic Resources

The North Jetty and Jetty A are located in Pacific County, Washington, near the communities of Ilwaco and Long Beach on the Long Beach Peninsula. According to the 2000 Census, Ilwaco had a total population of 950 people. Health care was the top occupational field in Ilwaco followed by retail trade, educational services, agriculture, and forestry. In 2000, Long Beach had a total population of 1,283 people. Accommodation/food services was the top occupational field in Long Beach followed by health care, retail trade, agriculture, and forestry. Cape Disappointment State Park (formerly Fort Canby State Park) is situated just outside of Ilwaco. This 1,882-acre, year-round park is a very popular recreation area and offers 27 miles of ocean beach, a campground, a boat launch, two lighthouses (Cape Disappointment and North Head), and hiking trails.

The South Jetty is located in Clatsop County, Oregon near the community of Warrenton. According to the 2000 Census, the population of Warrenton was 4,096. During the 1990s Warrenton's population nearly doubled and continues to grow rapidly. Fishing, lumber, agriculture, and food production are the largest industries in Clatsop County, although retail ranks among the largest economic sectors in Warrenton itself. Fort Stevens State Park is situated just outside of Warrenton. This 3,700-acre, year-round park is a very popular recreation area and offers camping, beachcombing, freshwater lake swimming, 9 miles of bicycle trails, 6 miles of hiking trails, wildlife viewing, an historic shipwreck, and an historic military area.

3. ALTERNATIVES

The following alternatives are being considered for the major rehabilitation of the North Jetty, South Jetty, and Jetty A located at the MCR. Additional work needed to accomplish any alternative of major jetty rehabilitation include such aspects as construction of barge offloading facilities, rock transport, etc. These additional aspects are discussed below the identification of the alternatives. Potential increases in footprints of the jetties by alternative are shown in Table 1.

3.1. Major Rehabilitation Alternatives

Alternative 1. Rehabilitate North and South jetties and Jetty A essentially within existing cross section/footprint using larger armor units (rock and/or concrete), and jetty length re-builds for each of the 3 jetties (larger rock size would achieve a higher reliability and reduce the need for interim repairs) (Figure 2 and Figure 5).

Alternative 2. Rehabilitate North and South jetties and Jetty A using a more reliable cross section, which could include larger armor units (rock and/or concrete), a toe berm, flatter side slopes, and jetty length re-builds for each of the 3 jetties (initial higher construction cost but should have a reduced chance of failure and reduce the need for interim repairs) (Figure 3 and Figure 6).

Alternative 3. Rehabilitate North and South Jetties and Jetty A using larger armor units (rock and/or concrete), a more reliable cross section and foundation improvements (includes spur groins for stabilization of foundations for each of the 3 jetties) and jetty length rebuilds for each of the 3 jetties (Figure 4 and Figure 7).

Alternative 4. This alternative could involve a combination of Alternatives 1, 2, and 3. The selected design will depend on modeling results.

Table 1. Potential footprints (including spur groins[1]) associated with Alternatives 1, 2, and 3.

	Alternative 1	Alternative 2	Alternative 3
North Jetty			
Shoreward Reach Base Width (ft.)	300	400	400
Middle Reach Base Width (ft.)	400	500	500
Seaward Reach Base Width (ft.)	500	650	650
Restored Length [max possible (ft.)]	2500	2500	2500
Spur Groin Additions (#)			
Shoreward Reach	0	0	1-4
Middle Reach	0	0	4-6
Seaward Reach	0	0	1-4
Total	0	0	2-9[2]
South Jetty			
Shoreward Reach Base Width (ft.)	400	500	500
Middle Reach Base Width (ft.)	500	600	600
Seaward Reach Base Width (ft.)	500	650	650
Restored Length [max possible (ft.)]	5000	5000	5000
Spur Groin Additions (#)			
Shoreward Reach	0	0	1-4
Middle Reach	0	0	4-6
Seaward Reach	0	0	1-4
Total	0	0	3-12[2]
Jetty A			
Shoreward Reach Base Width (ft.)	300	400	400
Riverward Reach Base Width (ft.)	500	650	650
Restored Length [max possible (ft.)]	1200	1200	1200
Spur Groin Additions (#)			
Shoreward Reach	0	0	1-6
Riverward Reach	0	0	1-4
Total	0	0	0-4[2]

[1]Spur groins could be a maximum of 600 feet in length

[2]Spur groin total for each structure is given as minimum to maximum numbers considered. This total varies from the sum of the totals by reach because the proposed number and location of the individual groins has not yet been determined.

3.2. No Action Alternative

The No Action Alternative would not involve any major rehabilitation work. This alternative would consist of initiating emergency repairs after a failure or short-term repairs prior to an anticipated failure on an as-needed basis. Under the No Action Alternative, there would be continued jetty degradation and erosion of the shoals upon which the jetties rest. No action would inevitably lead to the need for emergency repairs after a failure or short-term repairs prior to an anticipated failure on an as-needed basis. Emergency repairs are meant to be short term fixes and have relatively short life expectancies. Jetty breaches lead to accelerated degradation of the remaining structure and significant loss of underwater shoal material and shoreline loss. From an environmental standpoint, emergency repairs can be damaging as they do not allow time to consider impacts and limit construction options and timing to minimize impacts.

3.3. Major Rehabilitation Strategy

The intent of the alternative design concepts for major rehabilitation is three-fold: (1) improve the stability of the foundation (toe) of each jetty affected by scour; (2) improve the side-slope stability (above and below water) of each jetty; and (3) improve the stability of each jetty to withstand wave impact. A major rehabilitation study is underway which will identify and assess various jetty rehabilitation options to determine the most reliable and cost-effective long-term plan for rehabilitation of the jetty system at the MCR. The study is being conducted in two phases. Jetty roots and trunks will be the focus of the first phase of the major rehabilitation study. The study is scheduled for completion in March 2007 (Phase I). Since foundation stability is essential to obtaining a reliable long-term repair, spur groins perpendicular to the jetties will be evaluated. Tops of the spur groins would not extend above the water line and would be designed as to not cause safety concerns for vessels. Phase I also will evaluate methods to stop further recession of the jetty heads by stabilizing the existing head position. Jetty lengths will be studied and modeled to determine optimum lengths. Preliminary evaluations will occur during Phase I and complete evaluations during Phase II.

The rehabilitation work would occur along 12,200 feet of the North Jetty from Stations 0+00 to 122+00 (0+00 to 105+00 for Phase I and 105+00 to 122+00 for Phase II). For the South Jetty, rehabilitation would occur along a stretch of 23,050 feet from Stations 145+00 to 375+50 (145+00 to 315+00 for Phase I and 315+00 to 375+50 for Phase II) (Phase II extends to fully authorized lengths). For Jetty A, rehabilitation would occur along a stretch of 5,800 feet from Stations 40+00 to 98+00 (40+00 to 90+00 for Phase I and 90+00 to 98+00 for Phase II).

The potential offloading, dredging, piling, and stockpiling/staging areas for the North Jetty, South Jetty, and Jetty A are shown in Figure 8, Figure 9, and Figure 10, respectively. A temporary haul road for rock from either of the two potential barge offloading docks for the South Jetty in the vicinity of Parking Area D on Clatsop Spit (Figure 9) would be constructed in-water and connect the offloading areas to paved areas. To avoid dredging, the northerly of the two sites (known as Social Security Beach) would require a road of approximately 1,000 feet in length and the southerly site, closer to Parking Area D, would require a road of approximately 350 feet in length. The crest widths of the rock haul roads would be 30 feet, resulting in in-water toe width of 75-135 feet, increasing with distance from shore (with side slopes of 1 vertical to 1.5 horizontal). Each road would be installed with one, approximately 30-foot wide viaduct located at the midpoint in length of the ramps to allow for estuarine circulation. The Parking Area D site would require a haul road constructed

between the waters edge and the parking area of approximately 150 feet and would require vegetation removal (wetlands could be avoided, however).

Scouring has taken place on the north side of the North Jetty resulting in formation of a backwater area. Up to 16 acres that is often inundated with tidal waters that come through the jetty and also freshwater that drains through the accreted land to the north could potentially be filled in order to stabilize the foundation of the North Jetty (Figure 11). Filling would also eliminate the possibility of formation of a water connection between the ocean and this scoured area, which could occur with further recession of Benson Beach and result in rapid deterioration of the North Jetty.

Phase I of the rehabilitation work excluding the spur groins would require placement of up to approximately 3.7 million tons of rock and/or concrete armor units (1.2 million tons of rock for the North Jetty, 2.0 million tons for the South Jetty, and 0.5 million tons for Jetty A). Full jetty length rebuilds would add 1.5 million tons of rock for the North Jetty, 6.0 million tons for the South Jetty, and 0.5 million tons for Jetty A. Each 600-foot spur groin would add an additional approximately 53,000 tons of rock. Armor rock sizes for the proposed rehabilitation will range from 15 to 50 tons for the North and South Jetties and from 10 to 30 tons for the Jetty A.

Working during the winter storm season is considered unsafe. Therefore, rock placement operations will be conducted from June through October. Rehabilitation of the jetties would likely take at least 3 years to complete, possibly more. Actual construction timespan may be controlled by funding and/or stone availability.

The cross-section design (templates) proposed for Phase I rehabilitation of the North and South jetties and Jetty A lie essentially within the existing jetty footprint, based on the configuration of the original cross section, multiple previous repair cross sections, and redistribution of jetty rock by wave action. There may be a minor deviation of the proposed template design from the existing jetty configuration at rehabilitation areas where jetty damage has been extensive or scour along the toe has been severe. In areas where the wave height incident to the structure has increased and/or the foundation conditions are unreliable, some deviations from the original footprint may be necessary to achieve a reliable cross section.

In areas where foundation scour threatens the overall stability of the structure itself, spur groins perpendicular to the jetties and up to 600 feet in length will be considered to facilitate stabilization via accumulation of sediment along the jetty foundation. Although construction of additional spur groins have not yet been authorized, justification for constructing additional spur groins is supported by the Board of Engineers recommendation in 1903 that spur groins should be considered as needed on both sides of the North and South jetties should they be necessary to stabilize the foundation. There have been some degradation of shoals supporting Jetty A, but to a lesser extent than the North and South Jetties. This concept is being examined at Portland District and the Corps' Engineering Research and Development Center, Vicksburg, Mississippi to analyze the benefits added groins could have to improved foundation conditions. The number and length of spur groins to be installed is undetermined and will be dependent on modeling results and engineering analysis and design efforts. It is projected that between 5 and 25 spur groins could be installed on the 3 jetties combined (Table 1).

Staging areas are currently in place at the bases of the South and North jetties (from the recent interim repair work). Expansion of these staging areas for the major rehabilitation work may be necessary. If expansion occurs in wetlands, appropriate mitigation will occur.

The contractor selected for the major rehabilitation work will determine the appropriate jetty rock sources, determine acceptable and safe transportation routes to the jetties, and determine how best to unload and place jetty rock at the required locations. This EA addresses possible contractor methods of construction and access for the major rehabilitation work.

In-water sand placement between spur groins and at other locations to protect jetty foundations may be considered. Modeling in Phase I will provide preliminary results about whether or not there may be a need for in-water sand placement, with Phase II modeling and evaluations providing more complete evaluations.

3.3.1. Sources of Rock

There are few quarries locally or regionally that can produce the sizes and total quantities of rock required for the proposed action. It is likely that several quarries will need to be used. The majority of rock will probably be supplied by sources in northwestern Washington or by one or more of several potential sources that exist on or adjacent to Vancouver Island in British Columbia. Smaller amounts of rock also may be supplied by local sources in Oregon and Washington within 100 miles of the MCR jetties, and by quarries near Eureka in northern California (Figure 12). It is anticipated that large rock will come from quarries already in operation, thereby eliminating permitting requirements; however, it is possible that new quarries may need to be opened and require environmental permitting, which would be the responsibility of the contractor.

3.3.2. Transportation of Rock

Canadian Quarries

Quarries in British Columbia are typically located adjacent to waterways and rock produced from these quarries will likely have a very limited truck haul. Due to the extreme long distance to the MCR area, plus the immediate availability to deep water, rock would likely be loaded onto barges and shipped down the Washington Coast to potential barge off-loading sites at the MCR (see Section 3.3.3; Figure 13).

Washington Quarries

Quarries located in northern Washington are typically not on the water, but are generally located within 50 miles of a potential barge on-loading site. As a result, rock would need to be hauled, at least initially, by truck. Rock would be transported by trucks most likely to a barge on-loading facility or possibly all the way to the staging site at the jetty. In the event of a combination of trucking and barging, trucks would be loaded at the quarry, and then traverse public roads to existing facilities. Once the rock is loaded on barges, it would be transported down the coast to potential barge off-loading sites (see Section 3.3.3; Figure 14).

It also is possible that railway systems may be used to transport rock much of the way to the jetties. Burlington Northern Railroad operates a rail system that parallels Interstate 5 throughout Washington which would be the most likely route rock would be transported. Rock from the quarry would be taken by truck to a nearby railway station where they would be loaded onto railway cars and transported to an intermediate staging area. Trucks would then again take the rock the remainder of the way to the jetty staging areas.

Truck hauling of rock from northern Washington sources to the North Jetty or Jetty A most likely would be transported by public road to Interstate 5 or any of the main roads over to Highway 101.

Trucks using Interstate 5 would either turn at Longview on Highway 4 to Highway 101, or cross over the Longview Bridge to Highway 30 near Rainier, Oregon. From this point they would proceed west to Astoria to Highway 101, crossing the Astoria-Megler Bridge through Ilwaco to the jetty staging areas. Delivery to the South Jetty most likely would use main roads to Interstate 5 or any of the main roads over to Highway 101.

Trucks using Highway 101 south through Washington would likely cross the Astoria-Megler Bridge, go through Warrenton using local roads into Fort Stevens State Park and the staging area. Trucks utilizing Interstate 5 would either turn at Longview on Highway 4 to Highway 101, or on Highway 30 near Rainier, proceeding through Astoria to Highway 101, going through Warrenton through local roads into Fort Stevens State Park and the jetty staging area.

Rock located within southern Washington would likely be trucked to the jetty staging areas. An exception to this would be a quarry that occurs within just a few miles of a port on the Washington Coast or a quarry that is near the Columbia River. In either of these two barge possibilities, rock would be delivered by truck to a barge on-loading facility, loaded on oceangoing or riverine barges, and delivered to one of the barge offloading facilities (see Section 3.3.3). Truck hauling of rock from this area to the jetties would be as described above.

Oregon Quarries

Rock located in northern Oregon within 50 miles of the North Jetty and Jetty A would likely utilize any of the main roads over to Highway 101 or Highway 30. From this point they would cross the Astoria-Megler Bridge and proceed west through Ilwaco to the jetty staging areas. Quarries exceeding 50 miles from the jetties would likely utilize main roads at a farther distance from the jetty sites. This would involve longer haul distances on Highways 101, 30, 26, and others before crossing the Astoria-Megler Bridge and proceeding to the jetty staging areas (Figure 15).

Truck hauling of rock from quarries within 50 miles of the South Jetty will most likely utilize any of the main roads over to Highway 101 or Highway 30. From this point they would proceed through Astoria and Warrenton, or Seaside and Gearhart to local roads leading to Fort Stevens State Park and the jetty staging areas. Quarries exceeding 50 miles from the jetty would likely utilize main roads at a farther distance from the jetty site. This would involve longer haul distances on Highways 101, 30, 26, and others before going through Astoria and Warrenton, or Seaside and Gearhart to local roads leading into Fort Stevens State Park and the staging areas.

The likely mode of transportation from southern Oregon quarries is trucking, or a combination of trucking and barging. Many of the quarries may be near the Oregon Coast; however, they may not be near a port facility that has barge on-loading capability. Providing that barge facilities are available, rock located south of Waldport would be loaded at the quarry onto trucks and traverse main public roads to the barge on-loading site, loaded on ocean-going barges, and shipped up the Oregon Coast to one of the barge offloading facilities (see Section 3.3.3). Quarries north of Waldport would most likely be hauled by truck the entire distance.

Southern Oregon rock sources requiring trucking would be loaded onto lowboy trucks one to three at a time and would traverse main roads to more main arterials such as Highway 101 or, to a lesser degree, Interstate 5. An effort would be made to use the least distance possible to transport the rock without sacrificing transport time.

California Quarries

For northern California quarries, there would be a very long haul distance required to get rock to the jetty repair areas. Barging of rock would be the only economically feasible option. Rock would be transferred by truck from the quarries along main roads leading to Highway 101 to a barge on-loading facility (Figure 16).

3.3.3 Barge Off-loading of Rock

Depending on where the rock will be used, multiple barge off-loading facilities may be utilized including potential facilities associated with each of the three jetties (Figure 8, Figure 9, and Figure 10). Other potential sites are discussed below.

Commercial site in Ilwaco. For the North Jetty/Jetty A, barges would pull up to a dock at Ilwaco where rock would be transferred by crane onto trucks that would proceed by public road to Cape Disappointment State Park (formerly Fort Canby State Park). Trucks would then pass through the park grounds to the staging area adjacent to the jetty.

Commercial Site in Warrenton. Nygaard Logging Inc. has a deep water offloading site at their facility that could be used to offload rock. For the North Jetty/Jetty A, rock would be transferred to trucks which would likely use Highway 101 into Astoria, cross the Astoria-Megler Bridge, and head west through Ilwaco to Cape Disappointment State Park. Trucks would then pass through the park grounds to the staging area adjacent to the jetty. For the South Jetty, rock would be transferred to trucks which would then proceed west through Hammond and into Fort Stevens State Park and use the existing park road to the staging area adjacent to the jetty.

Contract-provided barge offloading site near South Jetty. Barges would dock at a site to be determined near Parking Area D within Fort Stevens State Park. For the North Jetty/Jetty A, rock would be unloaded by crane and hauled through the state park road to Highway 101, into Astoria, across the Astoria-Megler Bridge, and head west through Ilwaco to Cape Disappointment State Park. Trucks would then pass through the park grounds to the staging area adjacent to the jetty. For the South Jetty, rock would be unloaded by crane and hauled to the jetty via off-road trucks to the jetty staging area.

3.3.4. Dredging

Transport of rock to the jetties would most likely be done by ocean-going barges, which require deeper draft than river-going barges. Location(s) of barge offloading facilities, as well as volume of potential dredging, have yet to be determined. Development of barge offloading facilities adjacent to the North and South Jetties and Jetty A may require some dredging (see Figure 8, Figure 9, and Figure 10, respectively). Material to be dredged would be medium to fine-grained sand, typical of the lower Columbia River. Development of a barge offloading facility near Parking Area D would occur in deeper water far enough offshore that dredging would not be required. If offloading facilities were located closer to shore than as depicted in Figure 9, some dredging would be required. This material would also be sand. Disposal of uncontaminated material would occur either in-water or in uplands. No wetland fill would result from disposal of dredged material.

3.3.5. Placement of Rock

Placement of armor and fill rock on the jetties would be accomplished by marine- or land-based equipment. For marine-based delivery of rock, a tow boat and barge would deliver the rock to either side of the jetties where water depth, waves, and current conditions permit. During rock offloading, the barge may be secured to approximately 4-8 temporary dolphins/H-piles to be constructed within

200 feet of the jetty. The dolphins/H-piles would be composed of either untreated timber or steel piles driven to a depth of approximately 15-25 feet below grade by a vibratory pile hammer or similar equipment. If dolphins/H-piles are used, they may be relocated as work advances along the jetty and would be removed at the conclusion of the work. Rock would be off-loaded from the barge by a land- or marine-based crane and either placed directly within the jetty work area or stock piled on the jetty crest for subsequent placement at a later time.

For land-based delivery of rock, jetty access for rock hauling trucks would be via an existing paved road to the Benson Beach parking lot at Cape Disappointment State Park (North Jetty) and via an existing paved road to the parking lot at the South Jetty (see previous section). Work areas for delivery of rock, maneuvering of equipment, and stockpiling of rock near the jetties are already in place to facilitate recent and future repair work on the jetties.

For marine-based rock placement, a crane or a large track-hoe excavator could be fixed to a moored barge. The crane barge would be moored using either a series of anchors or the barge would be lashed to 4-8 temporary dolphins/H-piles paralleling the jetty work area (same concept a marine-based rock delivery). The crane or excavator would pick rocks either directly from the rock barge or from rock stock-piled on the jetty crest and place the rock into the work. The crane or excavator would advance along the jetty as work is completed.

For land-based rock placement, a crane or a large track-hoe excavator could be situated on top of the jetty. The placement operation would require the construction of a jetty haul road along the jetty crest within the proposed work area limits for each jetty. The crane or excavator would use the haul road to move along the top of jetty. Rock would be supplied to the land-based placement operation by land and/or marine-based rock delivery. For marine-based rock, the land-based crane or excavator would either pick rock directly from the barge or from a site on the jetty where rock was previously offloaded and stockpiled, and then place the rock within the work area. For land-based rock, the crane or excavator would supply rock via a truck that transports rock from the stockpile area. The crane or excavator would advance along the top of the jetty via the haul road as the work is completed.

4. ENVIRONMENTAL CONSEQUENCES

4.1. Commercial and Recreational Fisheries

4.1.1. Fish and Essential Fish Habitat

Almost all of the Columbia River offshore area experiences some type of commercial fishing activity. The major fisheries are for bottom fish, salmon, crab, and other species of shellfish. In-river commercial fishing is done for salmon and sturgeon. Bottom fishing by trawl for flatfish, rockfish and pink shrimp occurs year-round throughout the entire offshore area, primarily at depths offshore from the project area. Commercial and recreational salmon fishing occurs over much of the offshore area. Fishing seasons and quotas are set by the Pacific Fisheries Management Council and by the States of Oregon and Washington Fish and Wildlife agencies.

The Sustainable Fisheries Act of 1996 amended the Magnuson-Stevens Act establishing requirements for essential fish habitat (EFH) for commercially important fish. Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act, an EFH consultation is necessary for the above described actions. Essential fish habitat is defined by the Act in Section 3 (104-297) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to

maturity." The estuary and the Pacific Ocean off the MCR are designated as EFH for various groundfish and coastal pelagic and salmon species (Pacific Fisheries Management Council 1998, 1999). Essential fish habitat for groundfish, coastal pelagic, and salmon species and their life history stages that could occur in the vicinity of the proposed project are discussed below. Information on species habitat use was obtained primarily from the Pacific Fisheries Management Council (1998, 1999) and the National Marine Fisheries Service (NMFS 2005).

Temporary, negative impacts could result from jetty rehabilitation and barge offloading facility development. Placement of rock on native sediment adjacent to the jetties on both the channel and ocean sides and temporary turbidity resulting from placement of rock could negatively impact and result in loss of EFH.

With respect to rock placement in waters in association with jetty rehabilitation, EFH species that use river and sandy ocean bottom habitat could be affected. Those that use sandy bottom habitat could be affected by development of a possible barge offloading facility near Parking Area D. EFH species that use these types of habitat include the following: spiny dogfish (juveniles occur principally on bottom habitat, but primarily mud bottoms), lingcod (juveniles settle in estuaries and shallow waters along the coast), cabezon (juveniles settle to the bottom in estuaries and other shallow water areas), kelp greenling (juveniles settle to the bottom in estuaries and other shallow water areas), Pacific whiting (or hake) (juveniles reside in estuaries and other shallow water habitats), English sole (juveniles rear in estuaries and other shallow water areas), flathead sole (juveniles settle to the bottom in estuaries and other shallow water areas), Pacific sanddab (juveniles occur in estuaries on silty sand bottoms and other shallow water areas), and starry flounder (juveniles occur in sandy or muddy bottoms in estuaries). For species that use rocky, shallow water habitat such as rockfish, implementation of the proposed action would create additional habitat by construction of jetty spur groins.

In-water sand placement between spur groins and at other locations to protect jetty foundations may be considered. Modeling in Phase I will provide preliminary results about whether or not there may be a need for in-water sand placement, with Phase II modeling and evaluations providing more complete evaluations. Further evaluation on demersal fishes will be conducted if this is determined to be an option.

Other EFH species are not expected to be affected. An EFH assessment under the Magnuson-Stevens Act will be provided as part of the Biological Assessment to be submitted to NMFS for the proposed action.

4.1.2. Dungeness Crab

Dungeness crab constitutes an important local fishery, where the annual commercial harvest (male only) in the Columbia River region averages about 5.3 million crabs. They also constitute a popular sport fishery. Commercial crab fishing occurs from December to September with the majority of the catch occurring the first month of the crab fishing season. A minimal amount of crabbing occurs in river between the jetties. Most crab fishing occurs north of the Columbia River mouth at depths ranging from 25 to 250 feet MSL. Dungeness crab population numbers are subject to large cyclic fluctuations in abundance. Catch records for the fishery are generally believed to represent actual population fluctuations. Modeling studies by Higgins and others (1997) have shown that small scale environmental changes such as delay in the inshore currents in the spring by a short period of time can dramatically impact the transport of young of the year crab to inshore waters and their subsequent survival, but have no effect on adults and older juveniles inshore.

Females molt along the open coast, generally in the spring. Mating occurs at this time, but eggs are not extruded until the following winter. Eggs generally hatch between December and March, and larvae remain in the water column for a few months until they are carried offshore by ocean currents. Late-stage larvae are carried back inshore by currents in the spring. They metamorphose and settle to the bottom in late spring and summer. Settlement occurs in nearshore coastal waters and in estuaries; within estuaries, crabs settle in both subtidal and intertidal habitats. Crabs settling in intertidal areas may remain there during their first summer, but move into the subtidal zone in the fall. Few older crabs are resident in the intertidal, but move on and off the tidal flats with the tides. Crabs settling in nearshore waters may remain there for life, but there is evidence of some migration into the estuary between their first and second summers. Crabs remain in estuarine subtidal areas for up to two years, but late-juvenile and early-adult crabs leave the estuary before reproduction, which occurs mainly along the open coast. Both female and male crabs reach sexual maturity at about 2 years of age, but males may not breed until age 3 or older (Wainwright et al., 1992; personal communication, Dr. Walt Pearson of Battelle Laboratories, 2006). Abundance of juveniles in the estuary varies yearly, but is generally greater in the spring and early summer than in fall (Larson and Patterson 1989).

Extensive use by crabs occurs on sandy bottom areas on the south side of the North Jetty, and to a lesser extent on the north side of the South Jetty. Crabs move out of the estuary in large numbers (as 1+ aged crabs) along the northern part of the channel (south side of the North Jetty) in the fall and presumably move into the estuary as megalops in the spring. Megalops enter the estuary passively by current, mainly along the north side of the entrance (on the south side of the North Jetty) where current is strongest and salinity highest. Juvenile crabs are limited in distribution by salinity when salinity is below about 28 parts per thousand (ppt). When salinity is higher than 28 ppt, other factors such as predators and sediment characteristics tend to limit crab distribution (personal communication, Dr. Walt Pearson of Battelle Laboratories, 2006).

Modeling studies are currently being conducted at the Corps' Engineering Research and Design Center to assist in determining a more detailed design for the potential jetty spur groins. The modeling will provide information that will be utilized in establishing the number, dimensions, and locations for the spur groins. Modeling studies will show how current velocities and patterns, as well as sediment depositional patterns, could be altered near the North Jetty and South Jetty with a variety of potential spur construction scenarios. Construction of jetty spur groins could alter currents and migration paths of young crabs. If crabs would climb over the spur groins, they would not be susceptible to avian predators as the spur groins would be under water. When modeling is completed, it will be feasible then to predict potential effects to crab migration (in and out of the estuary) and their ability to settle in shallow water areas close to the North Jetty. After modeling, impacts to crabs from construction of spur groins could be more adequately addressed.

In-water sand placement between spur groins and at other locations to protect jetty foundations may be considered. Modeling in Phase I will provide preliminary results about whether or not there may be a need for in-water sand placement, with Phase II modeling and evaluations providing more complete evaluations. Further evaluations on potential impacts to crabs will occur if this is determined to be an option for sand retention.

4.2. Macrophytes and Invertebrates

The mobile sand community at the MCR provides habitat for such invertebrate species as polychaetes, clams, amphipods and crabs. The areas adjacent to the jetties are high energy zone and generally less productive than other areas of the estuary. The jetties provide rocky intertidal and subtidal habitat at the mouth of the estuary. Dominant macrophytes on the jetties include macro-

algae such as Fucus, Ulva and Enteromorpha that are attached to the rocks. Invertebrate species present include sponges, hydroids, sea anemones, crabs, tubeworms, limpets and mussels that live on the rocks or in crevices. There would be some loss of invertebrates with construction but those species occupying rocky habitats would colonize the newly placed rock and no long-term effects on populations are expected. Temporary adverse impacts could occur to macrophytes and invertebrates associated with calmer, shallower water areas with construction of a barge offloading facility near Parking Area D on Clatsop Spit.

4.3. Listed Fish and Critical Habitat

4.3.1. Federally-listed Fish

Federally listed populations [or Evolutionarily Significant Units (ESUs)] of fish under the Endangered Species Act (ESA) occur in the vicinity of the jetties. In general, adults use the lower river principally as a migration corridor to spawning areas in the upper basin and tributaries. They are actively migrating and normally do not spend any time in the lower river resting or feeding. Chum salmon (Lower Columbia River) and steelhead (Lower Columbia River) population spawn in tributaries to the Columbia River and Chinook and chum salmon (Lower Columbia River) spawn upriver in the mainstem Columbia River in gravels of appropriate size. No spawning would occur in the vicinity of the proposed action because of the lack of tributaries and appropriate spawning habitat.

Juveniles occur in the lower river during their out-migration to the ocean, in spring and summer. Juveniles that have already become smolts are present in the lower river for only a short time period before moving to the ocean. Juveniles that have not become smolts such as Chinook sub-yearlings spend extended periods of time rearing in the lower river. They normally remain in the lower river or estuary until fall or the following spring when they become smolts and then migrate to the ocean. Rearing occurs primarily in the shallow backwater areas upriver from the jetties.

In estuaries, juvenile Chinook salmon in general consume gammarid amphipods, insects, harpacticoid copepods, mysids, decapod larvae, and fish. Of the salmonid species, subyearling Chinook salmon stay in the estuary for the longest period of time and use the greatest variety of estuarine habitats (Bottom et al., 2001). Recent data were taken on spring-run Chinook salmon in the downstream part of the Estuary (PNNL 2005). Acoustically-tagged subyearling Chinook salmon (tagged in the Bonneville pool during spring and summer of 2005) in the Columbia River Estuary [detection nodes located at RM 5.6] appear to move back and forth past the nodes, indicating rearing as opposed to use of the area for outmigration only.

Another set of detection nodes at RM 2 are located just upstream of the MCR North Jetty disposal area. Data from these nodes show that sub-yearling Chinook salmon use nearshore areas adjacent to the Columbia River North Jetty more so than yearling Chinook salmon and steelhead. Subyearling residence times within the detection areas were about 15 to 20 times longer than yearling Chinook salmon and steelhead, averaging from 72 to 202 minutes dependent on release group (mean = 160 minutes). Subyearling Chinook salmon took longer to reach the MCR from Bonneville Dam (average 4.8 days) than yearling Chinook salmon and steelhead. Yearling Chinook salmon spend less time in the lower river much like steelhead, and do not use nearshore areas as extensively as sub-yearling Chinook salmon.

Steelhead are thought to spend little time in the Columbia River estuary during outmigration as smolts. Recent data appears to support this (PNNL 2005). Steelhead (tagged in the Bonneville pool during spring and summer of 2005) appear to move past the nodes in the estuary located near RM 5.6

more directly than subyearling Chinook salmon, indicating that they move out fairly directly to sea, generally being detected for periods of less than 30 minutes. Steelhead were generally detected in high numbers close to the navigation channel, however some were detected near the North Jetty, but to a lesser degree than subyearling Chinook salmon.

Chum salmon are distributed downstream of Bonneville Dam. Juveniles outmigrate primarily during spring. Juveniles enter estuaries from March to mid-May and most chum salmon leave Oregon estuaries by mid-May. Most juveniles spend little time in freshwater and rear extensively in estuaries. Juveniles feed in shallow waters and concentrate on epibenthic prey such as harpacticoid copepods and gammarid amphipods, but they may also eat terrestrial insects and other small crustaceans. Food limitation in shallow waters may induce movement to deeper waters where juvenile chum salmon shift their diets to include more pelagic prey, such as calanoid copepods, hyperiid amphipods, and crustacean larvae. Juvenile chum salmon appear to spend no time near the jetties.

Juvenile Snake River sockeye salmon rear in freshwater and outmigrate in spring and early summer, outmigrating primarily between April and early June. They spend little time in estuaries as smolts and are guided to ocean waters by salinity gradients. During downstream migration, smolts feed on gammarid amphipods. In estuaries they feed on euphausiids, fish larvae, juvenile shrimp, insects, amphipods, and mysids. Juvenile sockeye salmon appear to spend no time near the jetties.

Juvenile coho salmon outmigrate from April to August, but peaks in May. In estuaries, they feed primarily on large planktonic or small nektonic animals, such as amphipods, insects, mysids, decapod larvae, and larval and juvenile fishes (including other Salmonids). Coho salmon occur in the Columbia River estuary as smolts, and limited estuarine rearing occurs (more extensive estuarine rearing occurs in Puget Sound).

Bull trout are endemic to western North America and were more widely distributed historically. The Columbia River may have provided important historical rearing habitat for migratory bull trout and overwintering habitat (Buchanan et al., 1997; USFWS 2004). Occurrence of bull trout now in the lower Columbia River below Bonneville Dam appears to be incidental and occurrence above Bonneville Dam appears to be limited. Unlike the other listed fish that could occur in the region, the bull trout falls under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS) and would be addressed in the Biological Assessment to be submitted to that agency.

It is possible that adverse effects will occur to federally listed fish during construction. Temporary adverse effects could occur from placement of rock (on jetties and temporary haul roads from barge offloading docks) and resulting turbidity increases, noise and turbidity effects from driving of dolphins/H-piles for offloading at the jetties, and turbidity effects from construction of offloading facilities. Permanent adverse effects could result from alteration of currents about the jetties, changes to valuable rearing habitat near the North Jetty from sand deposition, increase in predation that could result in take of juvenile fish, and changes to possible entrance points to the Columbia River from extension of the jetties. Effect determinations will be made in the Biological Assessment to be submitted to NMFS. The Corps will enter into formal consultation with NMFS, who will issue a Biological Opinion for the proposed action. The Biological Opinion could include terms and conditions aimed to ameliorate impacts to federally listed fish.

4.3.2. Federally-designated Critical Habitat

The ESA defines critical habitat as, "The specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features (I) essential

to the conservation of the species and (II) which may require special management considerations or protections; and specific areas outside the geographical area occupied by the species at the time it is listed that are determined by the secretary to be essential for the conservation of the species."

Within the project area, critical habitat for anadromous salmonids includes the Columbia River from a straight line connecting the existing west end of the South Jetty and the existing west end of the North Jetty and extending upriver. For determinations on critical habitat, it is required that Primary Constituent Elements (PCEs) be identified (*Federal Register* 2004). For all salmonid critical habitat discussed in this EA, PCEs include the following:

- Freshwater Rearing Sites
- Freshwater Migration Corridors
- Estuarine Areas

Negative impacts could result from jetty rehabilitation and barge offloading facility development. Placement of rock on native sediment adjacent to the jetties on both the channel and ocean sides and temporary turbidity resulting from placement of rock could negatively impact and result in loss of critical habitat. Effect determinations to critical habitat will be made in the Biological Assessment to be submitted to NMFS.

In-water sand placement between spur groins and at other locations to protect jetty foundations may be considered. Modeling in Phase I will provide preliminary results about whether or not there may be a need for in-water sand placement, with Phase II modeling and evaluations providing more complete evaluations. Negative impacts to Federally-designated Critical Habitat could result from placement of sand and effect determination would also be included in in the Biological Assessment to be submitted to NMFS .

4.3.3. State-listed Fish

In addition to federally listed fish species and species with designated EFH, a variety of rockfish (bocaccio, widow, yelloweye, yellowtail, canary, greenstriped, redstriped, and tiger), as well as green sturgeon, river lamprey, and Pacific lamprey could occur in the vicinity of the MCR (Oregon Natural Heritage Program 2004; WDFW 2005).

White sturgeon are commercially caught in the Columbia River estuary and are captured by commercial gill nets in the estuary. White sturgeon migrate out to the ocean and can occur in the vicinity of the jetties. There is no evidence of green sturgeon spawning in the rivers of this region. Green sturgeon occur with white sturgeon and are anadromous and juveniles move downstream and rear extensively in estuaries before migrating to the ocean. Green sturgeon appear to prefer off-channel, slow-water habitats for rearing (Nakamoto et al., 1995 cited in Environmental Protection Information Center 2001). In estuaries, green sturgeon adults tend to concentrate in deep areas with soft bottoms. Because of their apparent preference for off-channel habitat as juveniles and their scarcity as juveniles in the Columbia River estuary and tendency to use deeper areas as adults, they likely would not be adversely affected by the proposed action; although the ecology of this species is not well known.

Lampreys enter the Columbia River in the late spring and early summer to spawn. The larvae (ammocoetes) are filter feeders that inhabit the fine silt deposits in backwaters and quiet eddies of streams (Wydoski and Whitney 1979). Lampreys are not expected to use areas in close proximity to the MCR jetties except for migration.

The addition of spur groins to the jetty structures could result in an increase in habitat for rockfish.

4.4. Federally-listed Marine Mammals and Reptiles

Federally listed whales that could occur in the vicinity of the MCR include humpbacked, blue, finback, sei, right, and sperm whales. Federally listed marine turtles that could occur in the vicinity of the MCR include the leatherback and loggerhead sea turtle. These species are migratory in the vicinity of the MCR, generally occur offshore, are usually associated with warmer waters occurring over the Pacific slope waters during summer, and are expected to easily be able to avoid disturbances. Most whale species observed by Green et al. (1991) occurred in slope waters (600 to 6,000-foot depths) or offshore waters and are expected to be capable of avoiding disturbances.

4.5 Terrestrial Wildlife and Seabirds

4.5.1. Federally-listed Species

Four bald eagle territories, two at Cape Disappointment, Washington (Cape Disappointment and Fort Canby pairs) and two on Clatsop Spit, Oregon (Fort Stevens and Tansy Point/Clear Lake pairs), occur in the general project vicinity (Isaacs and Anthony 2005). Bald eagles have multiple (alternate) nest sites; the nearest nest location for the Fort Canby pair is approximately 1.6 miles northeast of Benson Beach. The nearest nest location for the Cape Disappointment pair is approximately 2.2 miles northeast of Benson Beach. The Fort Stevens and Tansy Point/Clear Lake pairs are more than 3 miles from the South Jetty. The territories on Cape Disappointment, Washington lie adjacent to Baker Bay, a shallow subtidal and intertidal bay adjacent to Ilwaco and Chinook, Washington. Baker Bay probably represents the focal area for foraging by these pairs as waterfowl and fisheries resources are plentiful in the bay. Bald eagles have been observed foraging along the shoreline from Ilwaco to the Fort Canby boat launch, on or adjacent to West Sand Island, and from pilings scattered throughout the western portion of Baker Bay. Foraging activities along the MCR North Jetty and Benson Beach may occur infrequently. Bald eagles from territories on Clatsop Spit appear to forage in Trestle Bay. Other probable foraging locations include the various lakes scattered throughout Clatsop Spit and the shorelines and intertidal mudflats of the Columbia River estuary. Because bald eagles can readily avoid the construction areas, it is unlikely that this species would be impacted by the proposed action. The Cape Disappointment bald eagle pair nests in close proximity to roads through the park, but use of haul roads was less of a concern for nesting bald eagles because they appear to be acclimated to traffic and noise.

Brown pelicans occur in the Columbia River estuary and offshore areas between approximately late spring and mid-fall each year. These birds are thought to be comprised primarily of post-breeding migrants, 75%-85% of which are immature birds. Brown pelicans feed primarily on northern anchovies, which are common in estuaries during summer. Brown pelicans congregate on jetties, rocks, and sandflats in the project vicinity. The MCR South Jetty receives substantial use by brown pelicans. Pelicans forage over open water areas, including the MCR and bar, estuarine embayments and nearshore ocean waters. The waters at the MCR receive extensive vessel traffic from recreational and commercial fishing boats and ocean-going commercial ships and barges. East Sand Island is used extensively for a night roost/daytime loafing location. Numbers of brown pelicans at this location have ranged from 2,000-4,500 in recent years. Brown pelicans are commonly observed in and around human activities particularly recreational boating in Oregon bays, and appear habituated in many cases to human activity. Pelican flights, when encountered, typically exhibit a minimal avoidance response to boats and often are observed to not initiate any change in course or altitude. Because brown pelicans can readily avoid the construction areas, it is unlikely that this species would be impacted by the proposed action.

The marbled murrelet is a near-shore marine bird that is most frequently observed within 1.5 miles of shore (Marshall 1988). Marbled murrelets forage just beyond the breaker-line and along the sides of river mouths where greater upwelling and less turbulence occurs. Sealy (1975) cited in Marshall (1988) reported that murrelets foraged within 500 meters of shore. Murrelets forage within the water column; prey items include invertebrates and small fish such as anchovy, herring, and Pacific sandlance (Marshall 1988). Sandlance are known to occur in estuaries (NMFS 1991). Marbled murrelets nest in old growth/mature coniferous forests. The low incidence of marbled murrelets at coastal locations is probably related to the loss of old growth coniferous forest from harvest and/or fire on near-coastal lands (*Federal Register* 1991). Marbled murrelets are expected to occur in the general vicinity of the MCR. The Cape Disappointment area contains suitable habitat for marbled murrelet nesting. While nesting has not been reported in this area, birds have been noted in flight during the nesting season and it is likely that they nest in the area. This potential nesting area is located about 1.6 miles northeast of Benson Beach/North Jetty.

Murrelets typically forage within 500 meters of shore, but could readily avoid construction activities. Sand lance, a favored food item of the marbled murrelet would not be impacted by the proposed action. During construction of interim repairs at the North Jetty, the main concern of the USFWS was noise impacts to the marbled murrelet from passing trucks. This bird is presumed to nest in old growth spruce in close proximity to access roads from the north through Cape Disappointment State Park because it has been noted in flight in this area during recent years. As adult murrelets typically switch incubation duties in the early morning hours about one hour before sunrise and are susceptible to noise disturbance especially at this time, the following conservation measures were required during transport of rock to the North Jetty during interim repairs:

- Trucks will not unnecessarily stop along the haul roads.
- Trucks will be prohibited from using compression brakes (also known as jake brakes) on the haul roads except in emergency situations.
- Trucks will only be allowed to use the haul roads during daylight hours.
- These measures at least will be implemented again if trucking of jetty rock occurs through the park.

Western snowy plovers historically occurred in the vicinity of Clatsop Spit. No breeding or wintering plovers have been reported from these beaches in recent years (USFWS 2001). A small population of western snowy plovers occurs on beaches at Leadbetter Point, Washington, which is greater than 20 miles north of the general project vicinity. Other Washington locations where western snowy plovers are known to occur (e.g., Dammon Point, Conner Creek, and Midway Beach) are farther north. The nearest Oregon location is far south of the project site at Bay Ocean Spit in Tillamook County. Benson Beach is not designated as critical habitat. There is evidence of late-summer (August/September) influx of western snowy plovers into Washington and it is suspected that these wandering birds are migrants (USFWS 2001). There is a potential for occurrence of migrant, non-breeding western snowy plovers at Benson Beach, but these birds should not be disturbed by construction activities.

Columbian white-tailed deer occur on the Oregon and Washington mainland and instream islands primarily from Skamokawa, Washington (RM 34) upstream to Port Westward (RM 54). The proposed action is situated 34 miles downstream of the Julia Butler Hansen National Wildlife Refuge for Columbian White-tailed Deer. This species is not expected to occur in the MCR jetty areas.

The Oregon silverspot butterfly inhabits coastal headlands or Oregon Coast Range peaks that provide specific habitat features, primarily the presence of a particular species of violet, *Viola adunca*, the obligate plant species of this butterfly. The nearest populations of butterflies are the Clatsop County, Oregon population and the Long Beach, Washington population. These populations are located more than 5 miles from the proposed project site; the Oregon silverspot butterfly has not been seen in these areas in many years (personal communication Greg Smith, USFWS, September 21, 2005).

The short-tailed albatross was listed as endangered in 2001. It has been listed since 1970 outside of the United States and nests on islands south of Japan. There have been three confirmed records of short-tailed albatross off the Oregon Coast. The closest sighting was 20 miles southwest of the MCR (Marshall et al., 2003).

In summary, it is unlikely that wildlife species will be affected by the proposed project. Effect determinations for the proposed action will be made in a Biological Assessment to be submitted to the USFWS.

4.5.2. Oregon and Washington State-listed Species

Common loon, Clark's grebe, western grebe, horned grebe, red-necked grebe, Brandt's cormorant, bufflehead, rhinoceros auklet, Cassin's auklet, tufted puffin, black oystercatcher, harlequin duck, fork-tailed storm petrel, and peregrine falcon are species of concern in the states of Oregon and/or Washington (Oregon Natural Heritage Program 2004; WDFW 2005) and could occur in the vicinity of the MCR. The proposed action is not expected to affect these species.

4.5.3. Non-listed Species

Pelagic and Brandt's cormorants nest on the cliffs of Cape Disappointment (Corps 1999). Three species of terns occur in the Columbia River or over nearshore waters. Caspian terns are present from April to September and have established a large colony on East Sand Island within the estuary. Common and arctic terns occur off the Oregon and Washington coasts from April to September (Corps 1999) principally during migration. Shorebirds found on coastal beaches at the MCR and estuarine flats include western sandpipers, sanderlings, dunlins, least sandpipers, and semi-palmated plovers. Various species of gulls are common in the vicinity of the MCR. Shearwaters, auklets, murres, fulmars, phalaropes, and kittiwakes are occasionally noted in the vicinity of the MCR but more commonly offshore. The proposed action is not expected to affect these species.

4.6. Section 404 Waters and Wetlands

Scouring and has taken place on the north side of the North Jetty as well as settlement of the structure itself. Up to 16 acres that is often inundated with tidal waters that come through the jetty and also freshwater that drains through the accreted land to the north could potentially be filled in order to stabilize the foundation of the North Jetty. This will also prevent a water connection between the ocean and this area, which could occur with further recession of Benson Beach and result in rapid deterioration of the North Jetty. Wetlands are defined as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (Corps 1987). Wetlands have the following diagnostic characteristics:

- The prevalent vegetation consists of macrophytes that are typically adapted to areas having sufficient hydrologic and soil conditions necessary to support them. Hydrophytic plants (a plant

that grows partly or wholly in water) are determined by using the species-specific hydrophytic classification system in Reed (1988).

- Soils are present and have been classified as hydric, or they possess characteristics that are associated with reducing soil conditions.
- The area is inundated either permanently or periodically at mean water depths less than or equal to 6.6 feet or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation (Corps 1987).

Fill associated with most of the rehabilitation of the MCR jetties would occur in areas not vegetated but comprised of bare sand. These areas may not be considered "wetland" but still considered as Section 404 waters of the United States. A wetland delineation will be conducted to determine boundaries and acreages of Section 404 Waters of the U.S., including wetland and non-wetland areas. The area to be filled on the north side of the North Jetty landward of Benson would alleviate undercutting of the north side of the North Jetty and has been recommended to reduce foundation instabilities and to eliminate the de-stabilizing contribution of hydraulic flow through and around the jetty. Approximately 16 acres of Section 404 waters could be filled, of which a visually estimated 10% is vegetated (Figure 11).

This area was investigated on April 3, 2006 at a low tide (-0.1) that exposed the area. This is a tidally-influenced area that is also fed by freshwater through a large culvert under the access road. The majority of the area that would be filled is non-vegetated bare sand that is often inundated with tidal water and has developed because of scouring from tidal movement of sand out of the area through the jetty. It is not considered important habitat for aquatic species and was likely upland immediately after the jetty was constructed due to the rapid accretion of sand on the north side of the jetty. The bare sand areas meet hydrology criteria and possibly the soils criterion of wetlands described above, but does not meet the hydrophytic vegetation criterion. Soil here is mapped as the Westport Series, an upland soil, but it can and likely does support inclusions of wetland soil on site (Soil Conservation Service 1986). Slightly higher elevation fringe areas that are not so influenced by tidal water are vegetated with wetland grasses and are considered wetlands.

A Section 404 (b)(1) Evaluation will be prepared for all in-water fill associated with the proposed project, including the area behind the North Jetty, and will made available for public review. Along with preparation of the Section 404 (b)(1) Evaluation, Section 401 Water Quality Certificates will be requested from the Washington Department of Ecology and the Oregon Department of Environmental Quality. The amount of area considered as Section 404 waters and the amount of area considered as wetlands will be determined prior to these evaluations. Any mitigation required will be coordinated with the Washington Department of Ecology for areas filled behind the North Jetty and the Oregon Department of Environmental Quality in areas associated with the South Jetty. Any alteration of hydrology behind the North Jetty will be evaluated with respect to how this alteration could affect the hydrology of wetlands occurring on accreted land north of the access road leading to the North Jetty. It is the Corps intent to engineer work behind the North Jetty so as to not alter hydrology in a way that would negatively affect wetlands on the accreted land north of the access road to the North Jetty.

At the South Jetty, wetlands exist in the vicinity of Parking Area D (Figure 9) near where barge off-loading could occur. These low areas can be avoided with development of a haul road adjacent to them on higher ground. Construction of the rock haul roads from a potential barge offloading facility off of Parking Area D or Social Security Beach on Clatsop Spit, however, would require substantial fill in Section 404, non-wetland Waters of the U.S. A road from a barge offloading facility to Social Security Beach would be approximately 1,200 feet long and a road from a barge

offloading facility to Parking Area D would be approximately 300 feet long. In either case, the road would be about 40 feet at the base (approximately 1.1 acre of fill for road to Social Security Beach and approximately 0.28 acre of fill for road to Parking Area D).

4.7 Dredged Material Disposal Sites

The Shallow-water Site, located off the seaward end of the North Jetty, is an EPA-designated ocean disposal site that is highly erosive. It's boundaries do not overlap the authorized seaward end of the North Jetty. Most of the material eroding from this site moves generally to the northwest and settles on Peacock Spit, Washington. Use of this site ameliorates, to some extent, the erosion of Peacock Spit that has been occurring, which is thought to be a result at least in part due to the gradual jetty head recession. This site has supported large quantities of disposed dredged material in recent years, as much as 3.7 million cubic yards in one year. The extension of the North Jetty to its authorized length could alter current patterns and sand movement about the North Jetty but it is thought that jetty head extension would not negatively impact the ability to use the site. Currently, sand placed in the eastern part of the disposal site does not accumulate and is readily dispersed to the north by northwest while sand placed in the western part of the disposal site disperses to the west by northwest. Dispersion in the western part of the disposal site occurs to a lesser degree than the eastern part, with sand accumulating on the seafloor at the western part. Jetty head extension may result in less of a capability to use the eastern part of the site but increased capability to use the western part of the site. Modeling efforts, however, will establish how currents and sand movement would occur as a result of disposal at this site in the context of an extended jetty. It is thought that extension of the North Jetty seaward towards its authorized length would add sand back to the Benson Beach area. Phase II modeling will focus on determining optimal lengths of the jetties within the authorized lengths.

The North Jetty Site is an EPA-designated, non-dispersive disposal site located on the riverward side of the North Jetty and was established in order to aid in stabilization of the base of the. Spur groin construction may or may not be placed in this area and it is anticipated that the disposal site would continue to be used if needed. Coordination with EPA regarding disposal sites would occur prior to work on the jetties.

In-water sand placement between spur groins and at other locations to protect jetty foundations may be considered. Modeling in Phase I will provide preliminary results about whether or not there may be a need for in-water sand placement, with Phase II modeling and evaluations providing more complete evaluations.

4.8 Cultural and Historic Resources

The proposed action is being conducted in an area that is highly erosive and has previously been disturbed by jetty construction. Jetty site evaluations have concluded that shipwrecks or remnants of shipwrecks do not occur at the jetty locations (Corps 1998). The jetties are currently not listed on the National Register of Historic Places. It is planned that the jetties will be nominated for the National Register of Historic Places. Documentation of the structures will be coordinated with the State Historic Preservation Offices prior to alteration of the structures.

4.9 Socio-economic Resources

Construction vehicles and trucks hauling jetty rock for the proposed action will have a temporary, adverse impact on local traffic patterns in the Long Beach/Ilwaco area (North Jetty/Jetty A) and in

Warrenton/Hammond area (South Jetty). The proposed action also will have a temporary, adverse impact to recreationists at Cape Disappointment State Park and Fort Stevens State Park, and those using the jetty structures for fishing and crabbing. Heavy equipment using park roads and parking lots could delay or inconvenience park visitors. Park visitors could be disturbed by construction noise. A number of restrictions would be in place near the construction zones at each jetty to protect park visitors and the public. Some park roads and parking lots will likely be closed during construction. Access to the jetties and nearby beaches would be closed during construction, which would impact recreational crabbers and anglers. Reduction in the levels of recreational activity for 3-4 years could negatively affect the local economy of the Long Beach peninsula and the Warrenton/Hammond area, which are highly dependent on tourism.

Currently, small boat crabbers travel around the end of the North Jetty. Rehabilitation of the North Jetty to its authorized length would necessitate crabbers to increase their travel distance around the North Jetty. Full rehabilitation to the authorized length would result in approximately an additional 2,500 of above-water jetty. The proposed action would have no effect on utilities and public services.

5. COMPLIANCE WITH LAWS AND REGULATIONS

5.1. Clean Air Act

This Act established a comprehensive program for improving and maintaining air quality throughout the United States. Its goals are achieved through permitting of stationary sources, restricting the emission of toxic substances from stationary and mobile sources, and establishing National Ambient Air Quality Standards. Title IV of the Act includes provisions for complying with noise pollution standards. There would be a temporary and localized reduction in air quality during construction of the proposed action due to emissions from construction equipment. There also would be temporary and localized increases in noise levels from construction equipment. These impacts would be minor and temporary in nature, and would cease once construction is completed.

5.2. Clean Water Act

This Act requires certification from state or interstate water control agencies that a proposed water resources project is in compliance with established effluent limitations and water quality standards. The proposed action is expected to be in compliance with the Act. A Section 404(b)(1) Evaluation will be prepared for the proposed action and will undergo public review, subsequent to public review of this EA. The Section 404(b)(1) Evaluation will be submitted to the Oregon Department of Environmental Quality and the Washington Department of Ecology. These agencies will be responsible for issuance of the 401 Water Quality Certificates which may include terms and conditions to ameliorate impacts from the proposed action.

In addition, a National Pollutant Discharge Elimination System permit will be required from the U.S. Environmental Protection Agency for work performed on federal lands in the State of Washington and from the Oregon Department of Environmental Quality for work performed on federal, state, and local lands for the proposed action.

5.3. Coastal Zone Management Act

This Act requires federal agencies to comply with the federal consistency requirement of the Coastal Zone Management Act. This activity will be coordinated with the Oregon Department of

Environmental Quality, the Washington Department of Ecology with input from the local resource agencies. A consistency determination will be prepared.

5.4. Endangered Species Act

In accordance with Section 7(a)(2) of this act, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species. Information on federally listed species and designated critical habitat is presented in this EA. Two Biological Assessments will be prepared for the proposed action; one to address federally listed species under the jurisdiction of NMFS and the other to address federally listed species under the jurisdiction of the USFWS. The Biological Assessments will be provided to the respective agencies for their review and consultation. The Services will issue Biological Opinions that would likely set forth terms and conditions to minimize impacts of the proposed action.

5.5. Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act states that federal agencies involved in water resource development are to consult with the USFWS concerning proposed actions or plans. The proposed action will be coordinated with the USFWS in accordance with the Act.

5.6. Magnuson-Stevens Act

Some of the fish species that utilize the project area have economic importance and have designated Essential Fish Habitat (EFH). Information on fish species with designated EFH is presented in this EA. Also, EFH will be addressed as part of the BA submitted to NMFS; analysis of effects to EFH will be made in that document.

5.7. Marine Mammal Protection Act

This Act prohibits the take or harassment of marine mammals. It is possible that the proposed action could result in harassment of the federally listed Steller sea lion with construction at the existing above-water tip of the South Jetty. They can be present at any time of the year. This species will be evaluated in the Biological Assessment to be submitted to the USFWS and a determination of effect will be made. If only temporary disturbance would result from the action, the action will be coordinated with NMFS in the context of a Section 109 take permit.

5.8. Migratory Bird Treaty Act and Migratory Bird Conservation Act

These acts require that migratory birds not be harmed or harassed. Under the Migratory Bird Treaty Act, “migratory birds” essentially include all birds native to the U.S. and the Act pertains to any time of the year, not just during migration. The Migratory Bird Conservation Act aims to protect game birds. The proposed action may temporarily displace migratory birds. Impacts of construction at the jetties and haul of rock to the jetties could temporarily displace birds by causing flushing, altering flight patterns, or causing other behavioral changes, but it is not expected that effects would rise to the level of harm or harassment. Quarry operations, however, could lead to harm and harassment of migratory birds. When quarry operations are better defined, coordination may occur with the USFWS with respect to these acts if deemed necessary.

5.9. Natural Historic Preservation Act

Section 106 of the National Historic Preservation Act requires that federally assisted or federally permitted projects account for the potential effects on sites, districts, buildings, structures, or objects that are included in or eligible for inclusion in the National Register of Historic Places. This project is being conducted in an area that is highly erosive and has previously been disturbed by jetty construction and prior dredging. There are no recorded historic properties within the immediate project area. However, the proposed action will be coordinated with the Washington and Oregon State Historic Preservation Offices in order to obtain a Section 106 Evaluation in accordance with the Act.

5.10. Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (NAGPRA) provides for the protection of Native American (and Native Hawaiian) cultural items, established ownership and control of Native American cultural items, human remains, and associated funerary objects to Native Americans. It also establishes requirements for the treatment of Native American human remains and sacred or cultural objects found on federal land. This Act also provides for the protection, inventory, and repatriation of Native American cultural items, human remains, and associated funerary objects. There are no recorded historic properties within the immediate project area and the probability of locating human remains in this area is low. However, if human remains are discovered during construction, the Corps and/or contractor will be responsible for following all NAGPRA requirements.

5.11. Environmental Justice

This executive order requires federal agencies to consider and minimize potential impacts on subsistence, low-income, or minority communities. The goal is to ensure that no person or group of people should shoulder a disproportionate share of the negative environmental impacts resulting from the execution of this country's domestic and foreign policy programs. The proposed action is in compliance with Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations).

5.12. Executive Order 11988, Floodplain Management

The proposed action would have no effect on floodplains.

5.13. Executive Order 11990, Protection of Wetlands

As discussed previously, wetlands supporting hydrophytic grasses located behind the North Jetty may need to be filled. These wetlands occur as fringe habitat adjacent to tidally-influenced bare sand areas and have been created over the years as a result of tidal scouring of sand out through the jetty. Any plans for filling wetlands will be documented through public notice of the Section 404 (b)(1) Evaluation and will be coordinated with the Washington Department of Ecology.

5.14. Prime and Unique Farmlands

The proposed action would have no effect on farmlands.

5.15. Comprehensive Environmental Response, Compensation, and Liability (CERCLA) and Resource Conservation and Recovery Act (RCRA)

There is no indication that any hazardous, toxic, and radioactive waste (HTRW) are in the vicinity of the proposed action. Presence of HTRW would be responded to within the requirements of the law and Corps' regulations and guidelines.

6. COORDINATION

This Environmental Assessment (EA) was prepared in accordance with the National Environmental Policy Act of 1969, as amended. The EA is being issued for a 30-day public review period. The EA will be provided to federal and state agencies, organizations and groups, and various property owners and interested publics. Responses to public comments will be prepared. Public concerns identified in comments will aid in determination of whether or not an Environmental Impact Statement (EIS) is needed for the proposed action. If it is determined that an EIS is not required, a Finding of No Significant Impact will be signed, concluding the NEPA process.

The Corps has established a web site to keep the public informed about the repair/rehabilitation of the MCR jetties (https://www.nwp.usace.army.mil/issues/jetty/home.asp).

An agency coordination meeting was held on May 25, 2006 for the purpose of introducing the project to several agencies that will be involved with review of environmental documents. The Corps presented the current state of environmental review and engineering modeling to NMFS, USFWS, Washington Department of Ecology, Oregon Department of Environmental Quality, and Oregon Department of Land Conservation and Development.

Other environmental documents including Biological Assessments, Coastal Zone Consistency Determination, and a Section 404 b1 Evaluation will be prepared after engineering modeling results.

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Figure 1. Project vicinity.

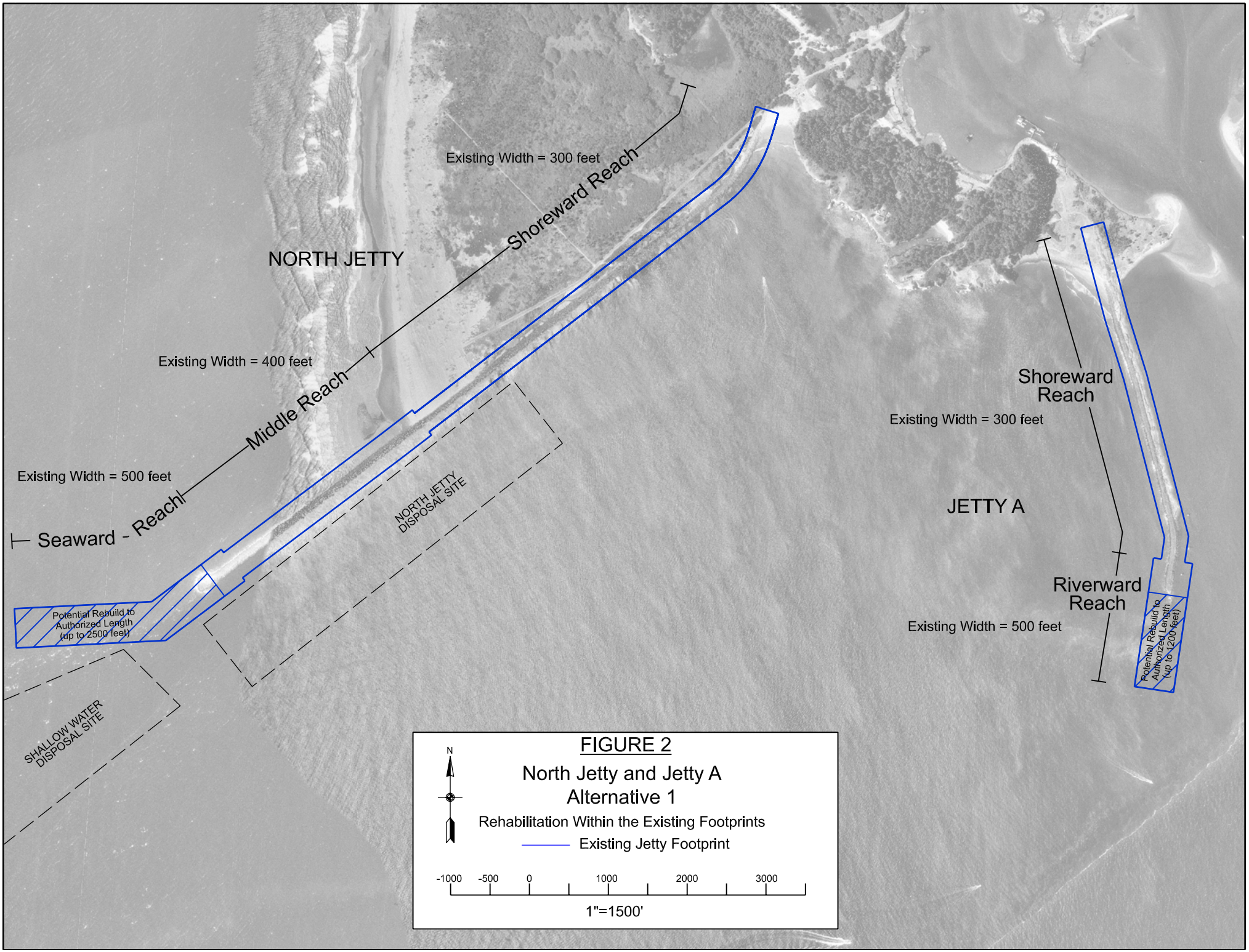
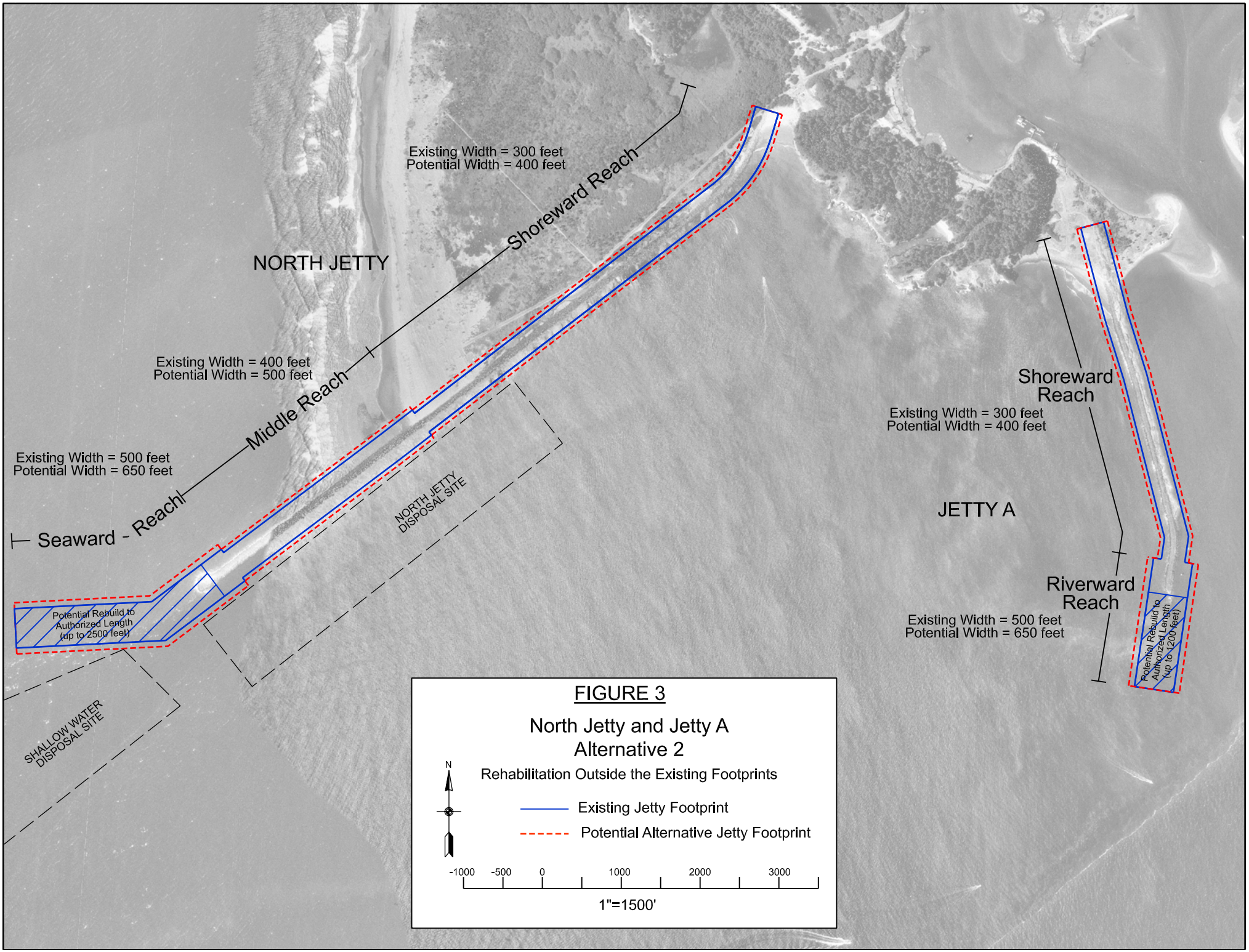


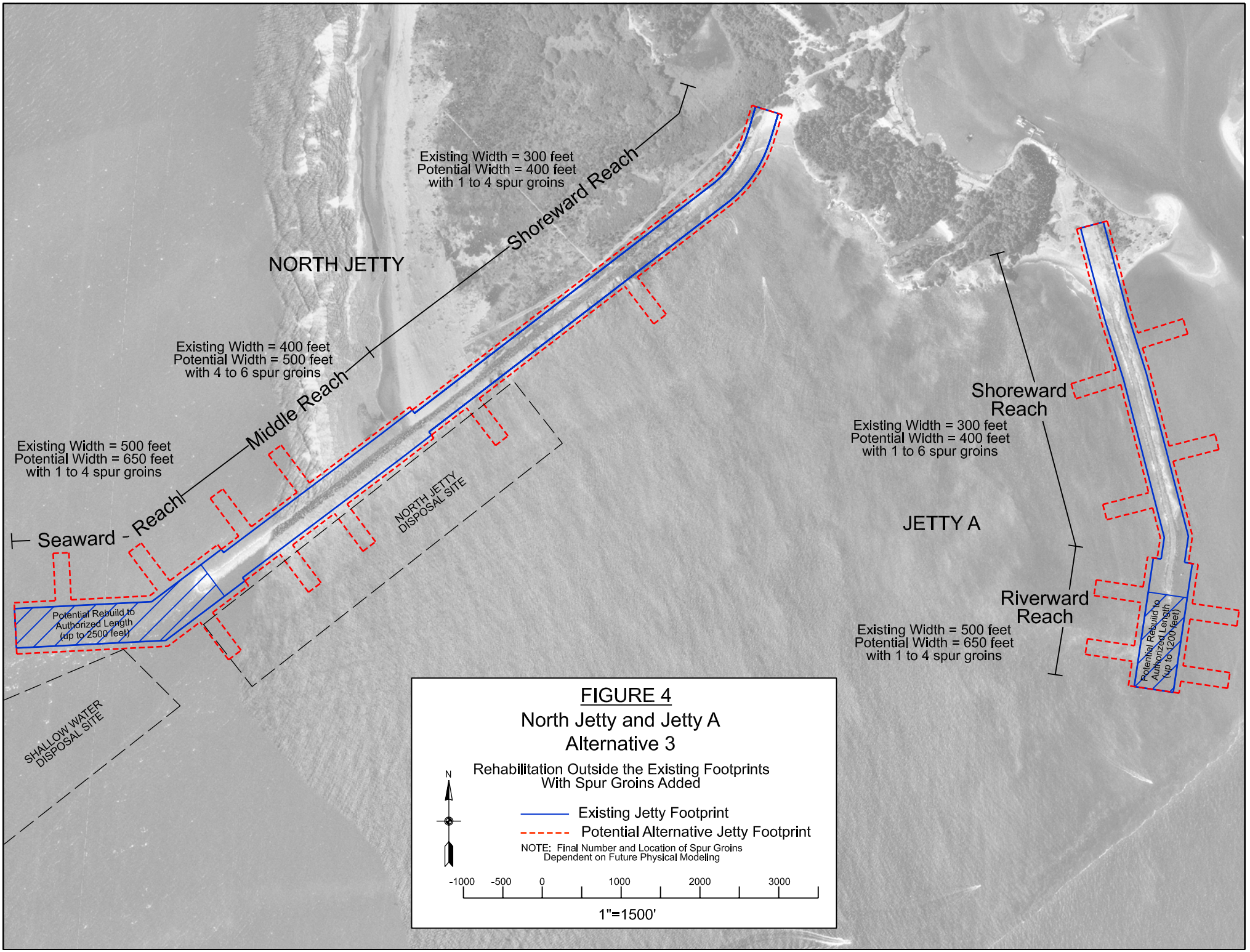
FIGURE 2

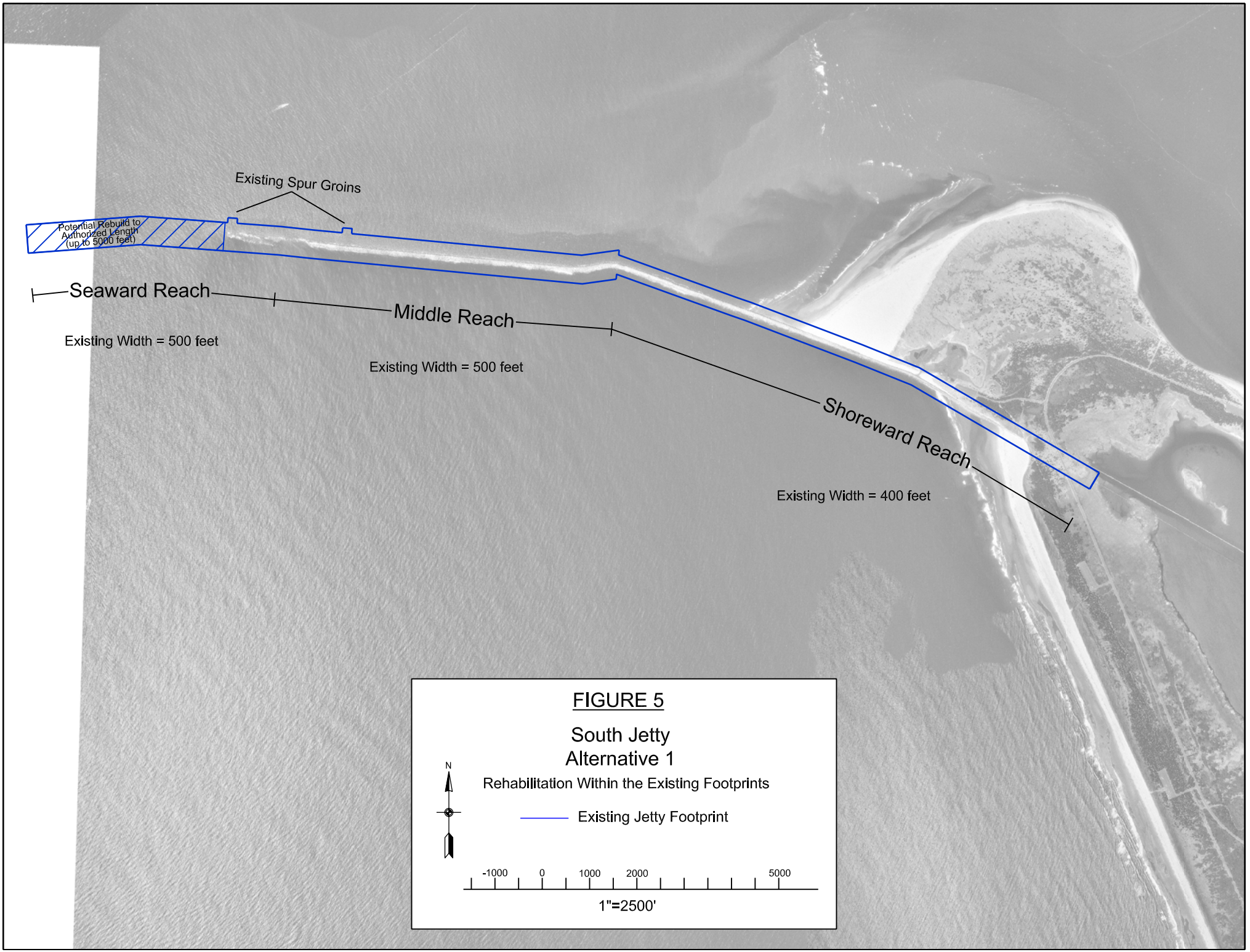
North Jetty and Jetty A
Alternative 1

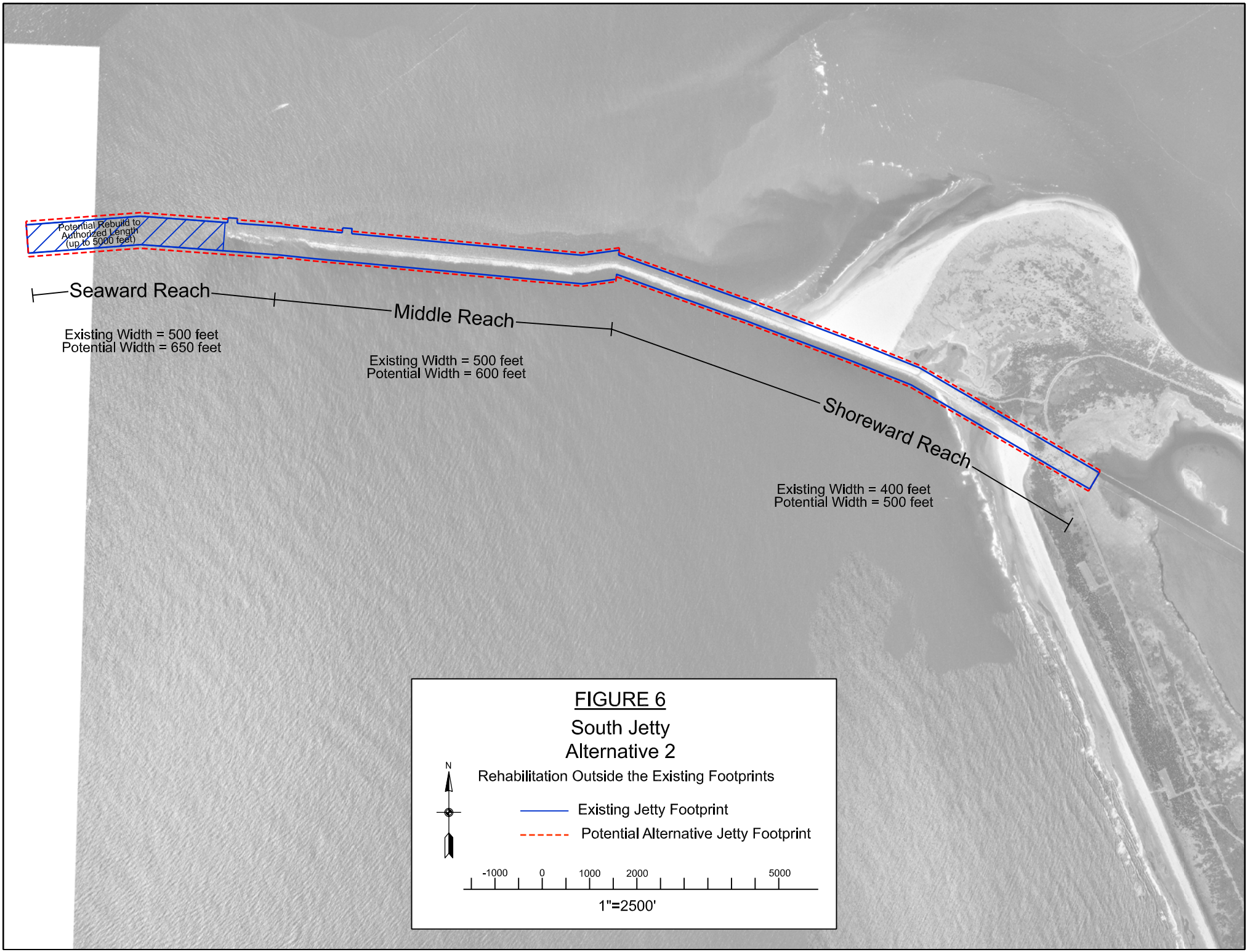
Rehabilitation Within the Existing Footprints

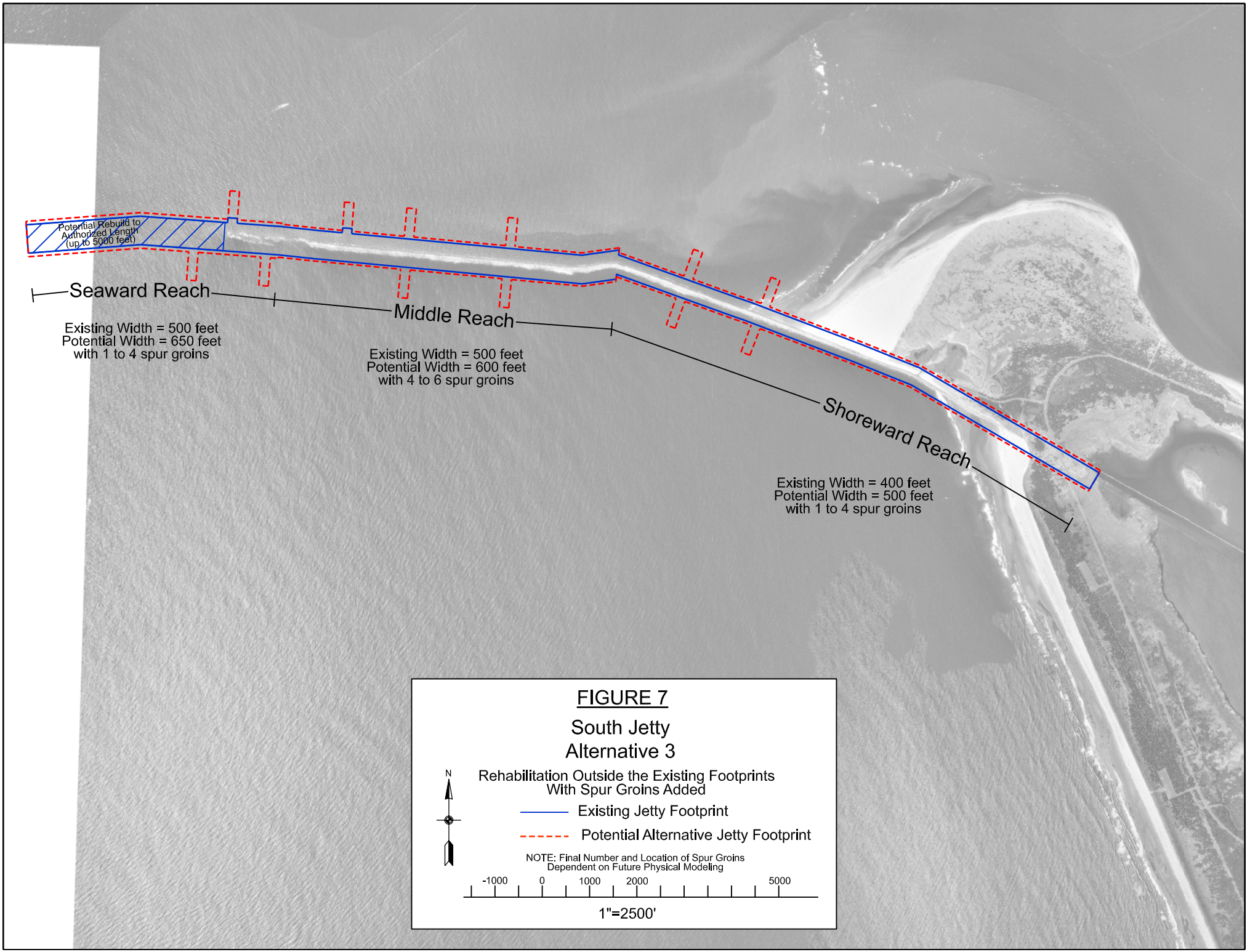
Existing Jetty Footprint


Existing Width = 300 feet
Potential Width = 400 feet
Shoreward Reach
NORTH JETTY
Existing Width = 400 feet
Potential Width = 500 feet
Middle Reach
Existing Width = 500 feet
Potential Width = 650 feet
Seaward - Reach
NORTH JETTY DISPOSAL SITE
Potential Rebuild to Authorized Length (up to 2500 feet)
SHALLOW WATER DISPOSAL SITE
Shoreward Reach
Existing Width = 300 feet
Potential Width = 400 feet
JETTY A
Riverward Reach
Existing Width = 500 feet
Potential Width = 650 feet
Potential Rebuild to Authorized Length (up to 1200 feet)
FIGURE 3
North Jetty and Jetty A
Alternative 2
Rehabilitation Outside the Existing Footprints
N
Existing Jetty Footprint
Potential Alternative Jetty Footprint
-1000
-500
0
1000
2000
3000
1"=1500'


Existing Width = 300 feet
Potential Width = 400 feet
with 1 to 4 spur groins
Shoreward Reach
NORTH JETTY
Existing Width = 400 feet
Potential Width = 500 feet
with 4 to 6 spur groins
Middle Reach
Existing Width = 500 feet
Potential Width = 650 feet
with 1 to 4 spur groins
Seaward Reach
NORTH JETTY DISPOSAL SITE
Potential Rebuild to Authorized Length (up to 2500 feet)
SHALLOW WATER DISPOSAL SITE
Shoreward Reach
Existing Width = 300 feet
Potential Width = 400 feet
with 1 to 6 spur groins
JETTY A
Riverward Reach
Existing Width = 500 feet
Potential Width = 650 feet
with 1 to 4 spur groins
Potential Rebuild to Authorized Length (up to 1200 feet)
FIGURE 4
North Jetty and Jetty A
Alternative 3
Rehabilitation Outside the Existing Footprints
With Spur Groins Added
N
Existing Jetty Footprint
Potential Alternative Jetty Footprint
NOTE: Final Number and Location of Spur Groins
Dependent on Future Physical Modeling
-1000 -500 0 1000 2000 3000
1"=1500'


Existing Spur Groins
Potential Rebuild to Authorized Length (up to 5000 feet)
Seaward Reach
Existing Width = 500 feet
Middle Reach
Existing Width = 500 feet
Shoreward Reach
Existing Width = 400 feet
FIGURE 5
South Jetty
Alternative 1
Rehabilitation Within the Existing Footprints
Existing Jetty Footprint
N
-1000
0
1000
2000
5000
1"=2500'


Potential Rebuild to Authorized Length (up to 5000 feet)
Seaward Reach
Existing Width = 500 feet
Potential Width = 650 feet
Middle Reach
Existing Width = 500 feet
Potential Width = 600 feet
Shoreward Reach
Existing Width = 400 feet
Potential Width = 500 feet
FIGURE 6
South Jetty
Alternative 2
Rehabilitation Outside the Existing Footprints
N
Existing Jetty Footprint
Potential Alternative Jetty Footprint
-1000
0
1000
2000
5000
1"=2500'


Potential Rebuild to Authorized Length (up to 5000 feet)
Seaward Reach
Existing Width = 500 feet
Potential Width = 650 feet
with 1 to 4 spur groins
Middle Reach
Existing Width = 500 feet
Potential Width = 600 feet
with 4 to 6 spur groins
Shoreward Reach
Existing Width = 400 feet
Potential Width = 500 feet
with 1 to 4 spur groins
FIGURE 7
South Jetty
Alternative 3
Rehabilitation Outside the Existing Footprints
With Spur Groins Added
N
Existing Jetty Footprint
Potential Alternative Jetty Footprint
NOTE: Final Number and Location of Spur Groins
Dependent on Future Physical Modeling
-1000
0
1000
2000
5000
1"=2500'

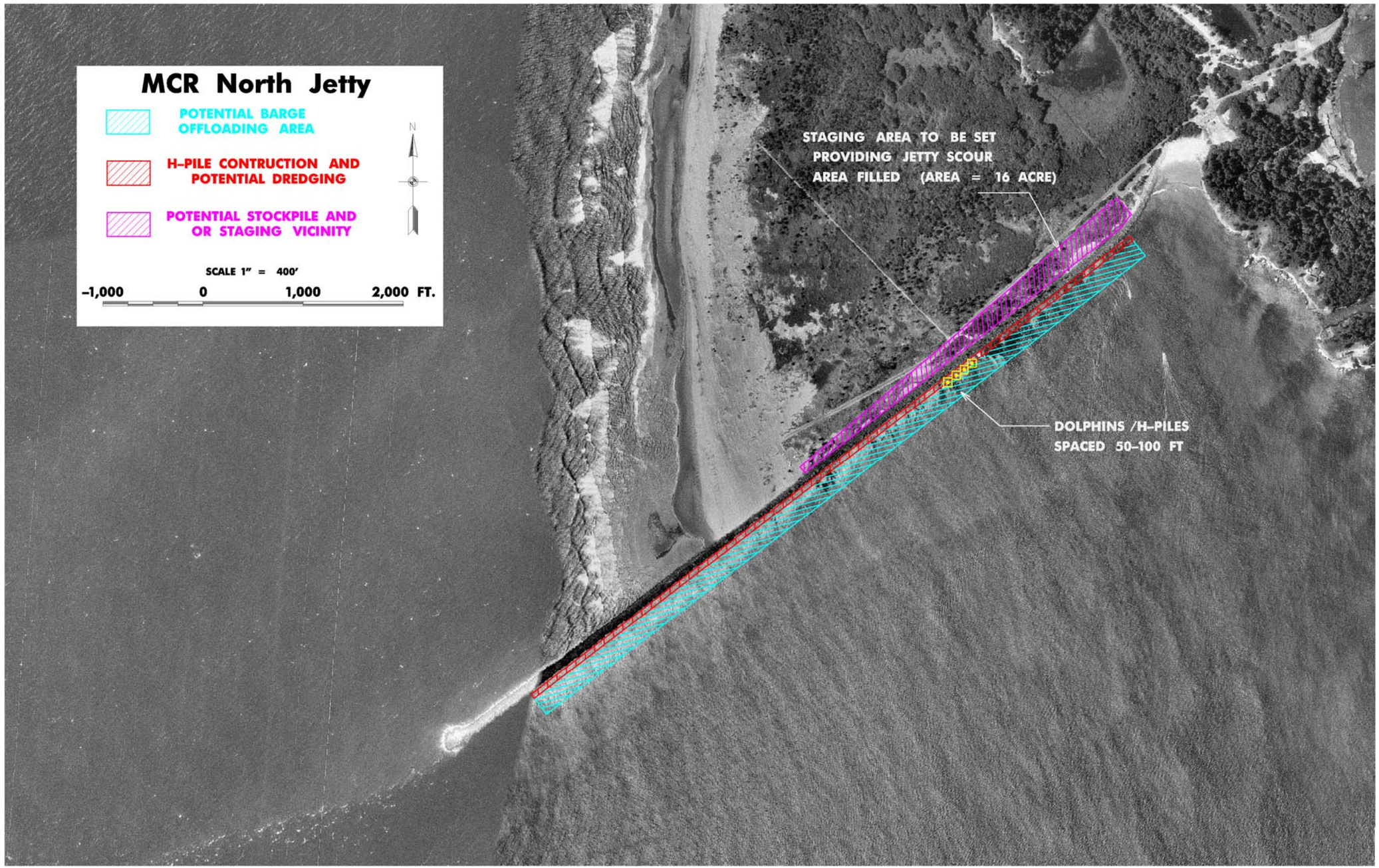


Figure 8. Potential offloading, dredging, piling, stockpiling/staging areas located near the MCR north jetty

Figure 9. Potential offloading, dredging, piling, stockpiling/staging areas located near the MCR south jetty

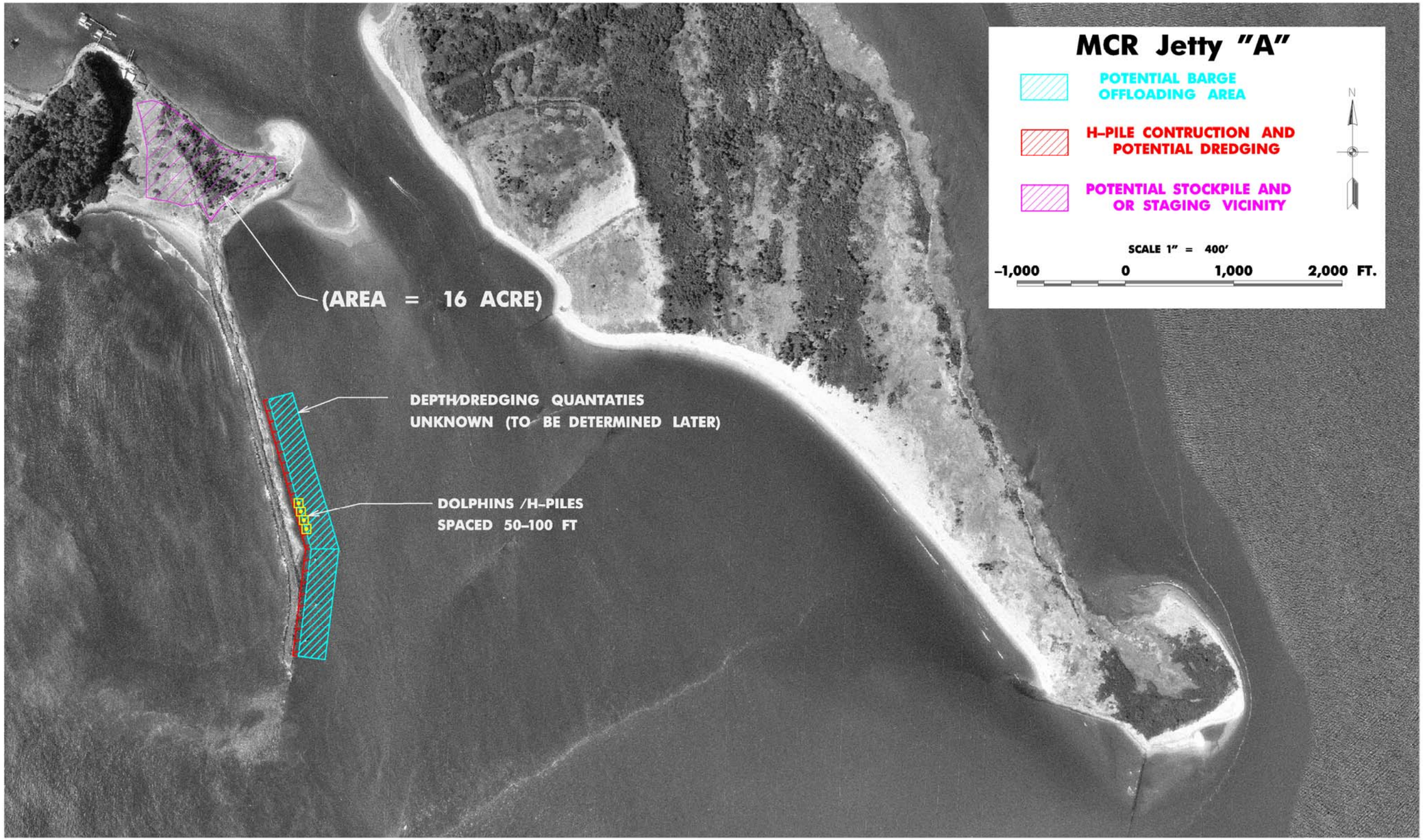


Figure 10. Potential offloading, dredging, piling, stockpiling/staging areas located near the MCR Jetty A

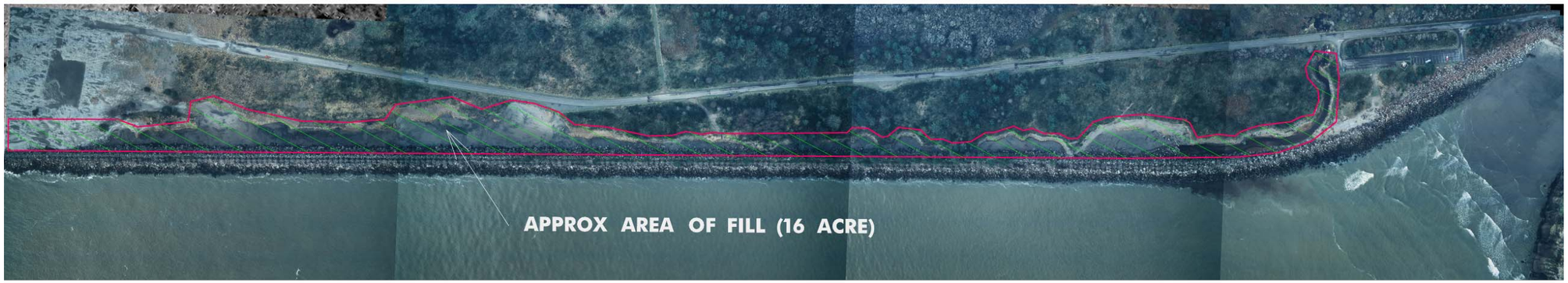


Figure 11. Potential area of fill of Section 404 waters behind the MCR North Jetty

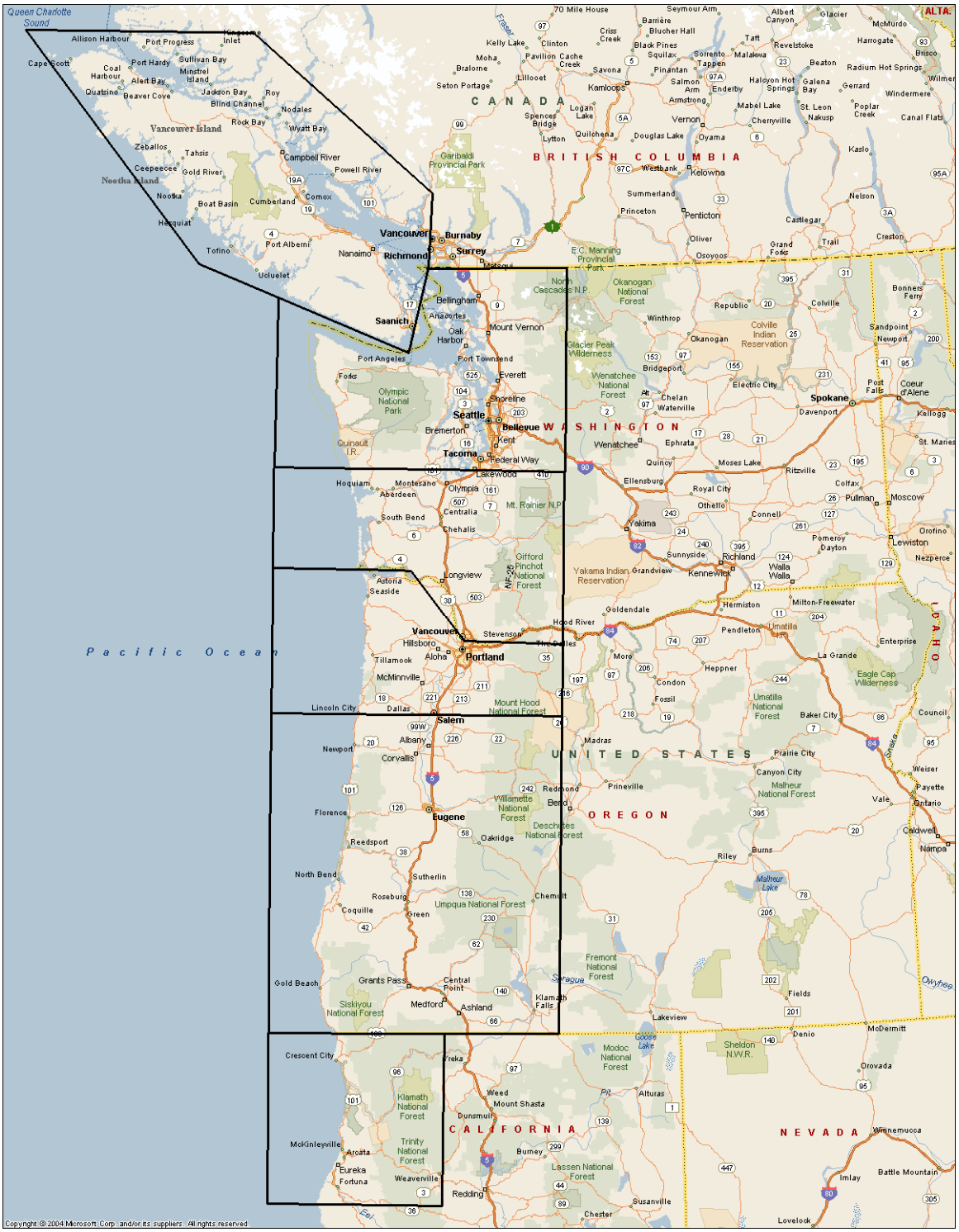


Figure 12. Potential quarry areas by region (British Columbia, northern Washington, southern Washington, northern Oregon, southern Oregon, and northern California).

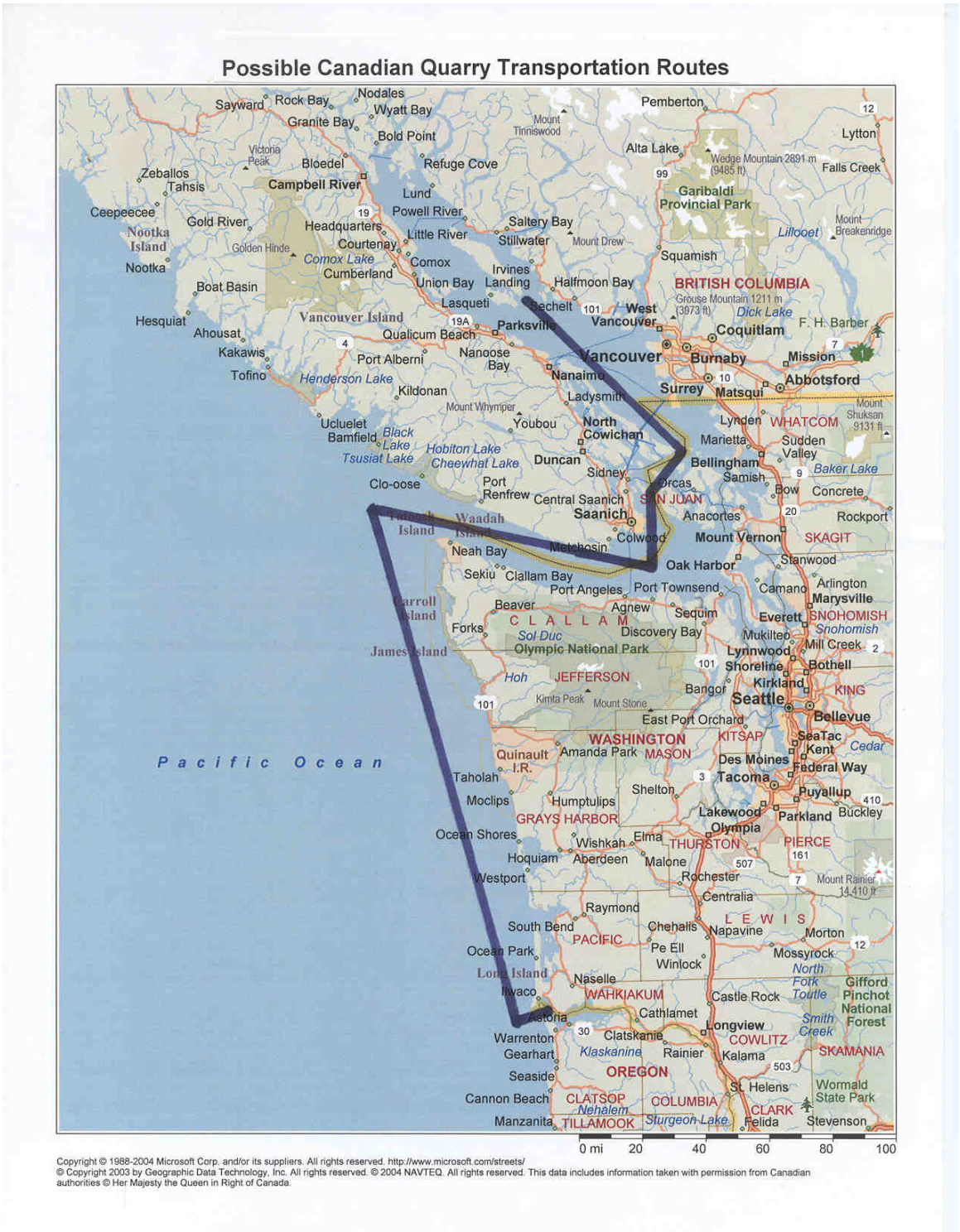


Figure 13. Potential barging route from British Columbia quarries to the MCR.

Figure 14. Potential barging and overland routes from Washington quarries to the MCR.

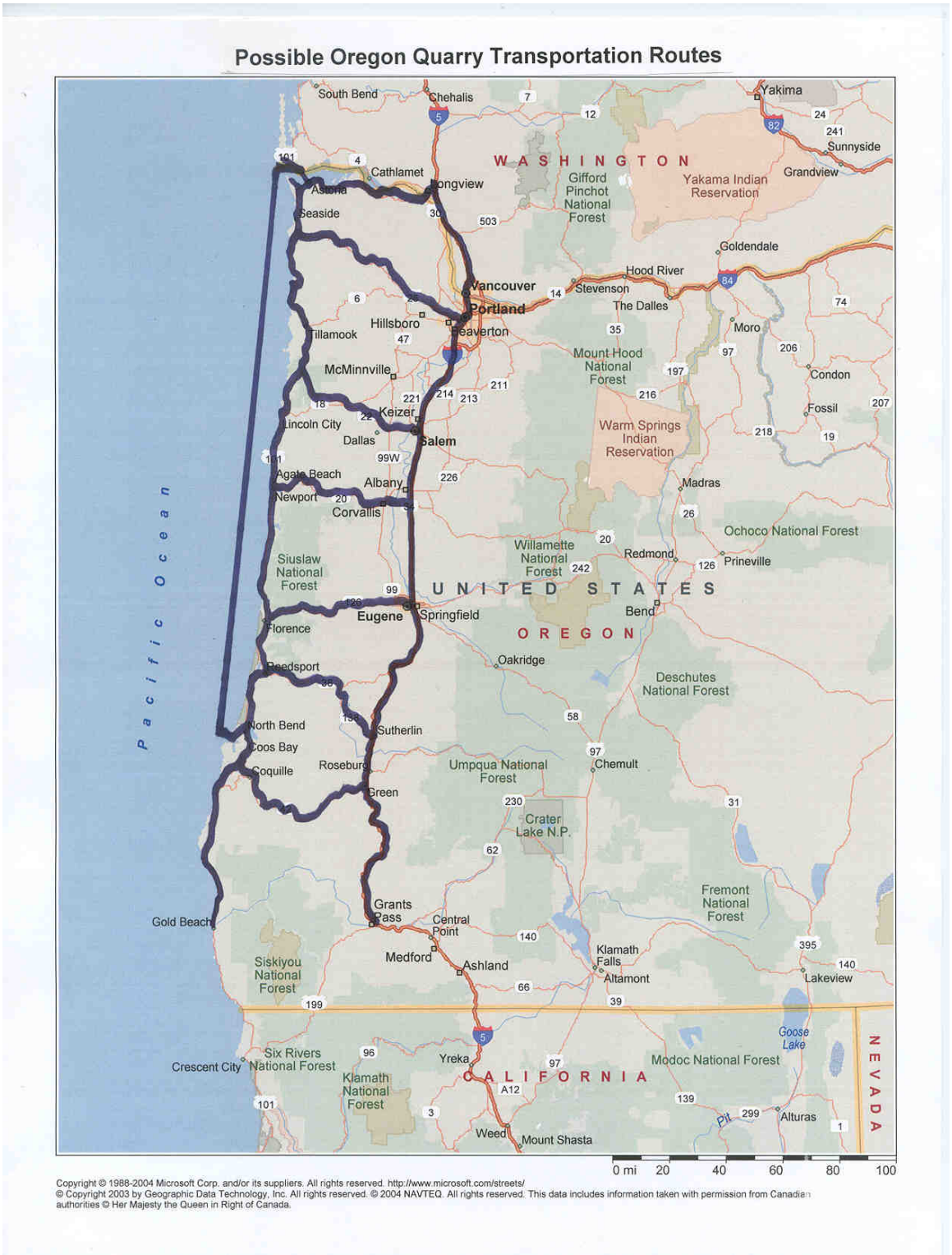


Figure 15. Potential barging and overland routes from Oregon quarries to the MCR.

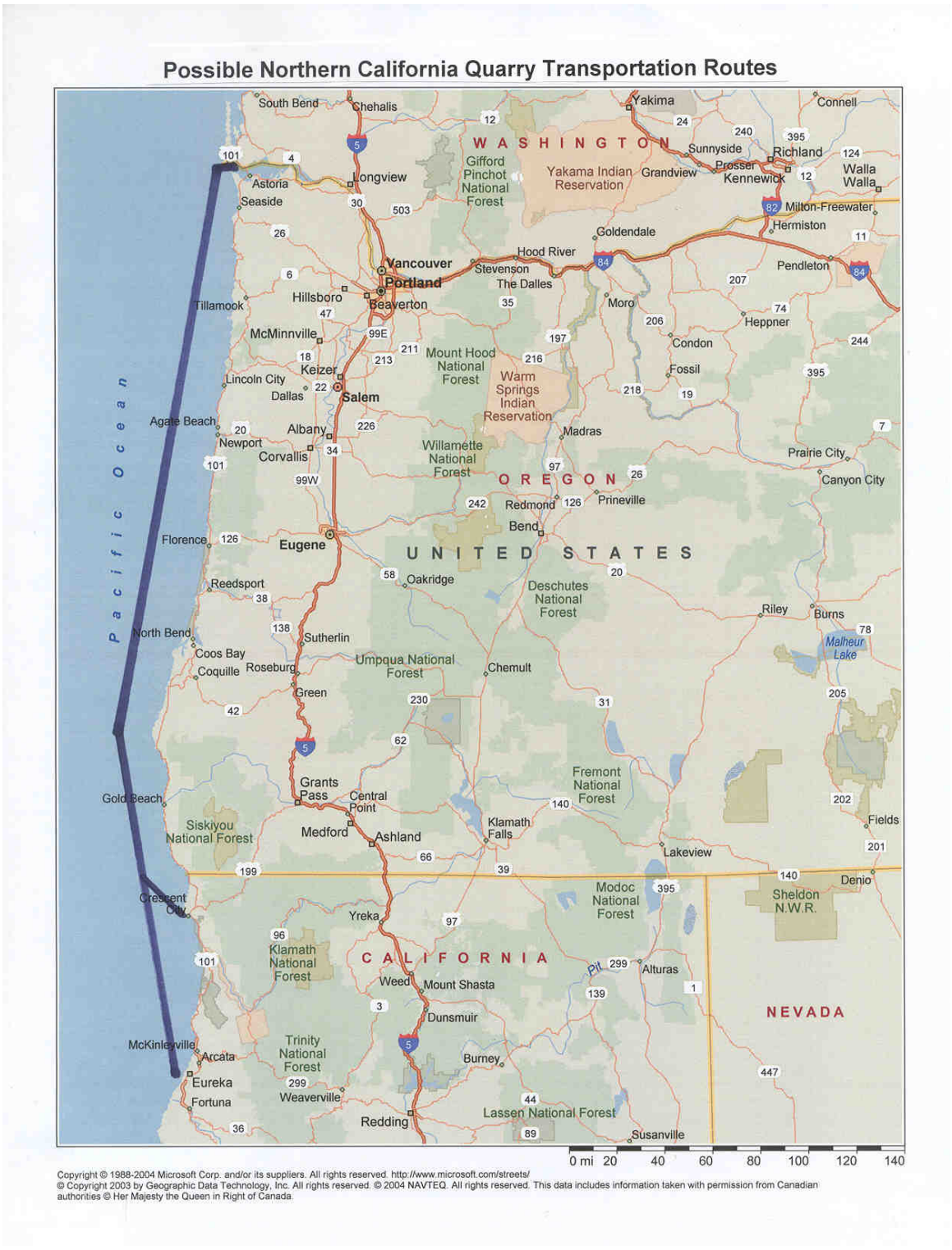


Figure 16. Potential barging route from California quarry to the MCR.